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A Pilot Approach to the Education of First Grade Public School Children with Problems in Bodily Schema, Perceptual-Motor and/or Language Development. Final Report.

Columbia Univ., New York, N.Y. Teachers College.; Union Free School District Number 1, Scarsdale, N.Y.

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Fifty-four kindergarten children were screened with the Sapir Developmental Scale to highlight deficiencies in bodily schema, perceptual motor skills, and language development, and were matched in groups of three by score, chronological age, and sex with one of the three acting as control. Three first grade classes were organized as follows: one experimental with 12 deficit children using a deficit centered training curriculum; one experimental with 24 normal children using a traditional curriculum; one control with six deficit children and 12 normal children using a traditional curriculum. The children were given a battery of psychodiagnostic tests in the fall and spring of the first grade. The results clearly favored the deficit children in the experimental class with significant differences in mean change in Wechsler Intelligence Scale for Children scores ($p=.05$), in visual perception and language functioning ($p=.01$), and in perceptual motor skills ($p<.05$). Important changes were also noted for the same groups in auditory-visual integration and visual perception, and in language development, particularly in expressive areas. Little difference was seen in the measurement of academic achievement. Performance favored the normal experimental group but without significant differences. (Author/SN)

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FINAL REPORT
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A PILOT APPROACH TO THE EDUCATION OF FIRST GRADE PUBLIC SCHOOL CHILDREN WITH PROBLEMS IN BODILY SCHEMA, PERCEPTUAL-MOTOR AND/OR LANGUAGE DEVELOPMENT

April 1967

U. S. DEPARTMENT OF
HEALTH, EDUCATION AND WELFARE

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Bureau of Research

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Selma G. Sapir

April, 1967

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Teachers College, Columbia University
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Union Free School District #1
Towns of Scarsdale and Mamaroneck
Scarsdale, New York

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INTRODUCTION

Problem

Substantial numbers of children with normal intelligence are classified as "learning disabilities," estimates ranging from 10 to 40% (52) (13) (24). Boys outnumber girls. Silver and Hagen (55) estimate 5 to 15% of the American school population without any demonstrable evidence of structural damage to the central or peripheral nervous systems are suffering from developmental language disorders. Although causation is multiple and complex, these children resemble each other in one or more of the following characteristics: poor concentration, short attention span, distractability, restlessness, lack of fluency in oral communication, poor coordination, directional confusion, poor memory and poor visual-motor, spatial and temporal organization. Although these youngsters clearly have adequate intelligence, they give the impression of striking immaturity.

At present the prediction for many of these youngsters is failure in school and they tend to become our hard core problems.

Even in the high socio-economic community of Scarsdale, by the time children have completed the primary grades, approximately 15 to 20% have problems in language skills or arithmetic. A review of the record of these children with learning disability reveals that in an overwhelming number of cases the problems were identified by the kindergarten teacher in terms of the syndrome described above. It is hypothesized that 30% of the children in kindergarten each year are potential learning disabilities and their problems are in bodily schema, perceptual-motor skills and/or language development. It is suggested that in some of these youngsters the erratic and uneven development tends to affect all areas of functioning. These patterns have been encountered so often that the question is raised as to whether neurophysiological immaturity -- that is to say a relatively primitive and undifferentiated level of perceptual-motor and linguistic functioning -- might be linked to subsequent deficits in academic learning which clearly require a high degree of differentiation and integration. (18)

Children with perceptual-motor, language and/or bodily schema problems can be identified at the five year level with screening techniques (18) (51). The basic question persists: Are there methods and procedures that can be developed for use in regular public school classrooms to prevent these future learning problems? Specifically, can training in bodily parts, right-left awareness, tactual, kinesthetic, visual and auditory perception, and language help children mature developmentally and achieve academically? Are our present curriculum techniques adequate or do they too need modification? Deficit training for the first year of the educational experience for those children with potential learning disability may make the difference - a lifetime of success or failure.

Although there is much awareness of the problem of educating these youngsters on the clinical level, it is the purpose of this study to interpret the clinical approach and translate it to a typical school setting. A theory of instruction for these youngsters should be concerned with developing skills in bodily schema, language and perception.

Children need an effective way to organize, categorize and integrate sensory stimuli so that they may become symbolized and readily available (11). For some children training in bodily schema, perceptual-motor skills and/or language development appears necessary to help them progress from the sensory-motor stage characterized by unstable attention and distractability to the more advanced stages of internal representation of their environment characterized by more attentional control. A structural approach in the basic skills should be integrated with the perceptual and language training.

It is suggested that as the child makes progress in the three R's, he is seen by himself, his parents, siblings and peers in a different light. This academic success builds in more learning. The chain reaction now becomes a pattern for growth in each child.

Significant Background

This research accepts the following theoretical framework with regard to the nature of development and the process of learning:

1. Development proceeds from a state of globality and lack of differentiation to a state of increasing differation, articulation and hierarchic integration (62).

2. There is recognition of the importance of awareness of bodily and spatial schema, their interrelationships and their significance to later orientation to the environment (33).

3. The development of language facilitates perception and academic learning (37) (60) (32).

4. The perceptual-motor development of the child is significantly related to academic success (8) (16).

5. The development of tests of differential diagnosis has led the way to the development of specific training procedures (34) (2) (22) (48) (55).

The first stages of development are relatively manipulative and sensory-motor marked by highly unstable attention or distractability, very single tracked (12). It is recognizable as Hebb's (30) early stage of establishing cell assembly; as Piaget's (45) Pre-Operational Stage in which assimilative and accommodative tendencies are working toward a more stable equilibrium or as Vigotsky's (60) early stage in which no external speech has been internalized.

A new born child explores and acquires motor learning. As the child explores, he begins to acquire knowledge of his world as separate from himself (33), becoming aware of his own body in space. Since spatial relationships in the physical environment are relative and since the point of origin of these relativities is the body and its relation to gravity, a firm body image becomes important to later orientation to the environment (53). From the motor experimentation and the sound body image comes the generalization "laterality" (33) (27). Laterality is thought to mean the preferred use and superior functioning of one side of the body over the other. Laterality implies an internal awareness of the two sides of the body. Directionality is the ability to project this awareness into extra-personal space so that one can discriminate right from left.

It appears necessary to get the perceptual field organized around your own person as center before you can impose other axes (12). Implied is a correspondence between the organization of bodily schema and the development of perception. Perception refers to the individual's organization and initial interpretation or categorization of what he sees, hears, touches, smells and feels. Since initial organization and interpretations change as a function of learning, many important changes in perception occur as the child develops.

There has been considerable speculation that children progress from tactual, kinesthetic, proprioceptive, and visceral sensitivity to progressively greater concern with visual and auditory cues, a shift from near receptors to distance receptors (7). A majority of the exploration was rated as tactual at age three to four while at age six to seven a majority was rated as visual. As the child matures and moves from kindergarten to first grade, he learns to deal with increasingly differentiated and highly integrated structures. These changes are characterized as a progression from less differentiation to greater differentiation and hierarchic integration of parts with respect to the whole (62). It appears, therefore, that integrative competence unfolds with maturation.

Language is the medium by which the child comprehends his world. It consists of communication with others and the development of the thought processes. Vigotsky (60) points to differences in the development of the semantic aspect of speech and the external vocal aspect. The child uses words first, then combines into sentences and proceeds to more complex external performances. However, in the development of meaning the child goes in the opposite direction. Words have the meaning of sentences and only later does the child understand the total meaning of the word. Vigotsky (60) has attached central importance to the period from three to seven years of age assuming that this is the period when speech is internalized and becomes the nucleus of abstract and symbolic thought. For the kindergarten years, speech becomes an instrument to regulate the self as well as the environment; the child talks to himself and effectively instructs himself while problem solving. When the content of utterances begin to have regulatory influence, speech simultaneously begins to shift from external to covert control. Luria (37) explains that speech helps the child to define the required cues. Speech substantially modifies the child's perception and permits the working out of a system of stable differentiated associations. It may be that at certain ages verbal mediation may become critical to the development of certain perceptual skills. Therefore, the integration of verbal mediation with perceptual training will be explored.

Literature implies variety of causation for learning disability. Suggested are "soft neurological signs" (42) (55), maturational lags (4) (18), emotional factors (20) (40), primary reading disability (48). Recognized is the complexity and overlap of etiology. Uneven and irregular development may have a multiplicity of causal factors. Unmet needs, sensory deprivation or biological deficiency may result in restrictive exploration (46) (31) (8). As a result of restrictive exploration, the child has little sense of his body in space. Problems may result in laterality and directionality. Harris (28) suggests that where laterality is not established, confusion exists in either motor activity and/or visual imagery. DeHirsch (18) suggests that ambiguous laterality is an expression of difficulty with spatial orientation and frequently found in combination with disturbances and formulation of spoken and printed language. Birch and Belmont (9) suggest that children change hand and eye preferences until the age of nine. Stressed rather is the importance of right-left awareness, and its relationship to the ability to read.

According to Birch (6), in the developing child reading disability stems from the inadequate development of appropriate hierarchical organization of sensory systems and in part is the product of the failure of visual systems to reach hierarchical dominance. Since it is Birch's thesis (6) that reading disability is due to an inadequate development of these higher and more complex and integrative levels of the visual perceptual function, it would be essential that we identify those cases where there is defective analytic and synthetic visual perception.

It has become increasingly clear to behavioral scientists that more systematic procedures need to be developed for measuring and stimulating the development of the perceptual-motor and linguistic processes of children with potential learning disabilities. In these children there appears to be an all-pervasive quality of disorientation, lack of differentiation, a primitivity in perceptual-motor gestalten, body image and poor temporal and spatial organization. They appear to have trouble at every level of integration. With variable intensity many of these principles have been successfully adopted by diagnostic and remedial clinics, treatment centers and hospitals. Much of the work is of a one to one tutoring type which is research oriented. Some of the preliminary findings appear encouraging (55) (17) (3) (22) (36), and confirm the relationships between bodily schema, perception, language development and academic success. Silver and Hagen (55) have developed a program of perceptual training using one sensory modality at a time with a significant degree of transference to the learning situation. Birch (6) tends to view the sensory-motor integrative process as more important.

Success with remedial techniques and perceptual training has led DeHirsch (18) to highlight the urgency of early detection and the establishment of classes in our public schools as preventative measures. Described are transition classes where instruction could be geared differentially to children with deficits in bodily schema, perceptual motor skills and language. For instance, certain times of the day, children with difficulties in language comprehension and discrimination might receive additional auditory-perceptual training; others might get assistance with visual discrimination and configural techniques, and the third group might receive help in directional and motor patterning.

> "At present, most school systems do not provide help for children failing in academic work until the third grade. This is unfortunate because

> the basic perceptual and linguistic functions that underlie reading may be harder to train at the end of the third grade than they are earlier during critical developmental periods. An essential first step then is an educational approach that will enable these children to become zestful participants in the learning process." (18)

A letter from the National Board of Education in Sweden (59) described Swedish "Maturity Classes," grades 1 to 3, organized for the purpose of giving a more individualized and soft school start for those children who show a somewhat slower development. "The classes are small, ten to twelve pupils, and much time is given to the training of perceptual skills and communication abilities, the necessary prerequisites for a more formal school training."

Why do some children who appear to be so unevenly developed and/or impaired, proceed to learn and to make normal progress? In some children motivation, supportive help from parents, clearly directed and structured environments appear to effect the functioning level of the child. Is there a compensatory factor? There is contradictory evidence in the literature regarding the effect of perceptual-motor and language training on academic success. Rabinovich (48), Deutsch (19) and Bryant (15) all confirm the importance of a special program with the combination of remedial techniques and training in areas of deficit, whereas reading experts like Gates (23), Sheldon (54) and Goins (26) maintain that there is little evidence to support the relationship between training in the perceptual areas and academic success.

Objectives

The hypotheses of this demonstration project are as follows:

1. Children with problems in bodily schema, perceptual-motor abilities and/or language development can be trained in areas of deficit.

2. This deficit centered training integrated with a structural approach to the 3 R's can be translated into significantly higher academic performance.

We also ask the following peripheral questions:

1. Will those children with deficits perform significantly better when isolated than those mixed in a class in which there are normal children?

2. Will those isolated children without problems make more growth academically than those placed in a mixed class which includes children with deficits?

This is an attempt to demonstrate that children with deficits in bodily schema, perceptual-motor skills and/or language development grouped in small self-contained classes taught with special techniques and trained in the areas of deficit will make more progress than those in our traditional heterogenous classes.

METHOD

Setting

A public school facility in Union Free School District No. 1, Scarsdale, New York, the Quaker Ridge School, has been utilized. This school has an acknowledged modern reading program and excellent equipment, materials and supplies. Adequate classroom facilities and special services are available. The population of Scarsdale is homogeneous in terms of educational background and socioeconomic status and is nationally recognized (41) as placing great emphasis on good schools.

Population

During the past three years, 170 primary school children in kindergarten, first and second grade who attend the Quaker Ridge School in Scarsdale, New York, have been screened at kindergarten entrance. Children with problems in bodily schema, perceptual-motor skills and language development have been identified with a screening instrument. This instrument is included in the appendix with a description, validity and reliability data. It is also described in "Sex Differences in Perceptual Motor Development" (51).

There were 34 girls whose ages at first grade entrance were 5/1 to 6/8 and 20 boys 5/9 to 6/7. Eighteen children in this group had been identified as having developmental problems with our screening instrument (Appendix A). These children were placed in three self-contained classrooms as follows:

1 experimental class with 12 children identified as having problems given special techniques and training.

1 control class with 18 children, six with problems and twelve without given traditional curriculum.

1 experimental class with 24 children without problems given traditional curriculum.

PILOT STUDY RESEARCH DESIGN

	First Grade Experimental Class #1	First Grade Control Class #2	First Grade Experimental Class #3
Composition of Class	12 "deficit" children with developmental problems	6 "deficit" children with developmental problems and 12 "normal" children without developmental problems	24 "normal" children without developmental problems
Treatment of Classes	Special curriculum techniques and training	Traditional curriculum techniques	Traditional curriculum techniques

Experimental groups (Classes #1 and #3) and control (Class #2) were matched as closely as possible by score on the screening instrument, chronological age and sex. For each two children in the experimental classes, there was one child in the control class so that for the developmentally "deficit" children the ratio was 12:6; for the children without deficits, 24:12. Two other factors that play an important role in the child's development are intelligence and home background. These variables were not controlled but their influence was evaluated. Because of the nature of the community and its homogeneity all the children were of average or better I.Q. on the Stanford-Binet Vocabulary sub-test. The differences in background were minimal. Chronological age and sex have been controlled because of the variability shown by norms at this age level for the tasks required on the screening instrument. Gesell (25) and Birch (8) as well as the Stanford-Binet test itself indicate variability of performance at the 4½ to 5½ year level and the study of the screening instrument revealed sex differences on these tasks at .05 level of confidence (51).

Three experienced teachers taught the first grade classes. The teachers cooperated in the study by having observers in the classroom, giving group tests and keeping careful records. All teachers recorded curriculum covered and materials used for each two-month period. This helped clarify differences between curriculum in the experimental and control classes.

In developing a curriculum (Appendix C) for the experimental class with "deficit" children, certain assumptions were made. Because "deficit" children do not constitute a homogeneous group in the nature or extent of their deficits, it was deemed important not only to train specific sensory modalities but to help these children integrate the modalities with each other and cognitive function. These children were alike in that they all had difficulty in organizing their environment and a great deal of training was done in this area. Stimulation was seen as essential but it was organized to act as a clue to learning. Emphasis was placed on slow and even pacing with much overlearning. Verbal mediation was seen as a method of providing clues for solution and as an aid in the integration of all perceptual function. Reading instruction was not delayed but was used to stimulate perceptual and integrative functions. Children were taught from the elements to wholes -- letters to words to sentences.

Evaluation

The research assistant administered individual tests to each "deficit" child in the fall and retested in the spring. The tests administered were as follows:

Wechsler Intelligence Scale for Children
Bender-Gestalt with Koppitz (35) Scoring
Draw-A-Person Test with Harris (29) Scoring
Illinois Test of Psycholinguistic Ability (34)
Hawthorne Concepts Scale (48)
Harris Test of Lateral Dominance (27)

The following group tests were administered to all the children in the fall and spring:

Marianne Frostig Test of Visual Perception
Science Research Associates Test of Primary
  Mental Ability
New York State Readiness Tests (fall only)
Stanford Achievement Tests (spring only)
Structural Reading Tests (spring only)

Mean change in each group from fall to spring was analyzed for significance. Differences of mean changes between the experimental and control groups were then compared for significance.

Consultant services of Dr. Arnold Gold, Assistant Professor in Pediatrics and Neurology of Columbia University Medical College of Physicians and Surgeons, was provided. First grade children whose parents had given permission were screened by Dr. Gold without any background data. Dr. Gold rated the children on a 1-10 scale with five considered borderline dysfunction. A case study approach helped compare data from all sources. Relationships between diagnostic and process testing, neurological findings and academic achievement were considered.

Pediatricians and psychiatrists in the community cooperated in the study by encouraging parents to have their youngsters participate in the neurological survey and allaying any anxieties parents expressed. Some pediatricians became interested and involved in the school program as a result of the research.

The research assistant, in addition to gathering the diagnostic and process testing data, visited each class once a month from November to May for observations and recording of curriculum, materials and methodology in each of the classes. This helped us analyze the differences and similarities in program.

School administration was involved to the extent of interest, dedication and cooperativeness, the planning of the class organization and a commitment to adhere to any restrictions that may be imposed by the research project.

Parents were involved in regular individual conferences and first grade meetings held as standard procedure of the school.

RESULTS

Selection Procedures

In our original survey with the "Sapir Developmental Scale" (c) (Appendix A), 18 of 54 first grade children were identified as having problems in bodily schema, perceptual-motor and/or language development. Norms were established at the 70th percentile and 18 children were judged with this scale to be developmentally deficient. These 18 children scored below 61 on the scale (range 0-95) and revealed deficits in at least two of the three areas: bodily schema, perceptual-motor and language function. The range of scores in the total first grade population was 39-84 with "normal" population mean score 69.055, S.D. 8.414, and "deficit" population mean score 50.0, S.D. 9.029; t-7.657, $p<.001$, differences significant at better than the .001 level of confidence.

Thirteen of the children in this first grade population were diagnosed by Dr. Arnold Gold, pediatric neurologist of the College of Physicians and Surgeons, to have "minimal cerebral dysfunction." These 13 children were among the 18 children which the scale designated "deficit." None of the "normal" children were so rated by the neurologist. Because two of the "deficit" children were ill, only 16 of the 18 were seen by the neurologist. 81.25% (p .001) of the "deficit" children seen were diagnosed by Dr. Gold to have "minimal cerebral dysfunction." The Sapir Developmental Scale (c) was able to differentiate children with minimal cerebral dysfunction at better than the .001 level of confidence.

Table 1 shows a comparison of the "normal" and "deficit" population with the Developmental Scale, the New York State Reading Readiness Test and the Marianne Frostig Test of Visual Perception, the last two administered eight months after the children were so diagnosed

Insert Table 1

with the Sapir Developmental Scale (c). This again validates the findings of the Developmental Scale. All tests show significant differences between populations at better than the 1% level of confidence.

Correlations between the Sapir Developmental Scale (c) and the New York State Reading Readiness Tests and its subtests and the Marianne Frostig Test of Visual Perception and its subtests, administered eight months after the Developmental Scale are shown in Table 2. The

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Insert Table 2

Developmental Scale and all its subsections correlate significantly at the 1% level of confidence with the total New York State Reading Readiness score (r-.6598, p.001) and its subtest Matching (r-.6348, p .001), Alphabet (r-.5330, p .001) and Copying (r-.5749, p .001). These are the subtests that Gates & Bond (23) has listed as most significantly related to reading. The lack of correlation between the language section of the Developmental Scale and the New York State Reading Readiness test is very puzzling and warrants further study.

Correlations of the Developmental Scale with the Marianne Frostig Test of Visual Perception show more variability. Total test scores show significant correlation (r-.4474, p .001) at the 1% level of confidence. The subtests Eye-Hand Coordination (r-.4646, p .001), Figure-Ground (r-.4522, p .001), and Spatial Relationships (r-.4855, p .001) correlate significantly with the Developmental Scale, but subtests Form Constancy and Position in Space do not.

The fall testing verifies the validity of the matching procedures. The mean scores of the children in both matched groups on the standardized tests are quite similar. They can be observed in Table 3.

Insert Table 3

"Deficit" Children

Bodily Schema

This function was measured by the Harris Test of Lateral Dominance, Draw-A-Person Test and the Hawthorne Concepts Scale. With the exception of the Harris Test of Lateral Dominance and two subtests of the Hawthorne; Time and Directionality, the difference of mean change favored the experimental group. [redacted].

Insert Table 4

Table 4 reveals that the experimental group made significant growth from fall to spring in the total Hawthorne (t 3.556, p .01), Quantity and Dimension subtest (t 2.275, p .05), Writing subtest (t 3.099, p .01). The control group made significant growth in two subtests of the Hawthorne, Directionality (t 3.952, $p<.01$) and Time (t 4.472, $p<.01$), as shown in Table 5.

Insert Tables 5 and 6

Draw-A-Person Test (developmental quotient score 49-146). Both groups were below average in the fall and spring. Small gains were in favor of the experimental group with a narrowing of the range of scores from 26 to 16 points.

Perceptual-Motor Function

This function was measured by the Frostig Test of Visual Perception, the Science Research Associates Primary Mental Ability Perceptual Subtest, the Bender Gestalt Visual Motor Test and the Birch Test of Auditory-Visual Integration.

Insert Tables 7 and 8

Rapid growth is shown in all tests of perceptual-motor function for all groups. In all cases but position in space subtest of the Frostig, the experimental group showed greater growth. Mean change from fall to spring in all the perceptual-motor tests are significant at .01 level in the experimental group, as shown in Table 7.

The Frostig Test of Visual Perception and all its subtests, the SRA Perceptual and Spatial Relationship subtests, the Bender-Gestalt Visual Motor Test, and Birch's Test of Auditory Visual Integration all point to more growth in the experimental than the control group.

In all five Frostig subtests (scaled score 3-16), the mean change from fall to spring was positive in the experimental group (1.5 in Spatial Relationship to 3.416 in Figure-ground) as compared to the mean change in the control group (-.50 in Form Constancy to 2.0 in Position in Space). There is significant difference between the groups in the total Frostig score (t=3.00); and Spatial Relationship subtest (t=2.993); p<.01 level.

Insert Table 9

In the SRA Mental Ability Perceptual subtest (quotient score 40-180), the experimental group had a mean change of 19.916 (fall, M. 104, S.D. 9.9; spring, M. 123.9, S.D. 12.82) as compared to a mean gain of 9.833 in the control group (fall, M. 110, S.D. 11.32; spring, M. 119.8, S.D. 16.8).

Using the Bender-Gestalt Visual-Motor Test (error score 0-25), both groups at mean age six years, six months, tested markedly below normal (5½ year level). Their protocols were scattered, diffuse and disorganized. The spring testing revealed a difference of mean change (2.4) favoring the experimental group. In addition, the experimental group showed a marked decrease in problems of articulation, rotation and distortions. Only three children of the twelve in the experimental group were below age level in the spring, and these three came up to the six year level, while only one child out of the six control children reached that level. The remaining five of the control group were at the $5\frac{1}{2}$ year level. From an organizational standpoint, the experimental children's records became more carefully planned, better spaced and more discrete than the control children's.

In the fall with the Birch Test of Auditory-Visual Integration (raw score 0-10), both groups did poorly. This is a highly integrative task. Birch's mean score for normal first graders at mean age six years, six months, is M. 5.6, S.D. 2.2 (9). By the spring, the mean score in the experimental group was M. 6, S.D. .7, with a mean change of 2.25, whereas in the control group, the mean was 4.33, S.D. .8, with a mean change of .33. Eight children out of twelve in the experimental group achieved auditory-visual integration above the norm as compared to two out of the six in the control group.

Language Development

Language was measured by the Illinois Test of Psycholinguistic Ability (standard score 3 to -3).

Insert Table 10

There is significant difference between the mean change in the experimental and control group in the total ITPA ($t = 3.213$, $p < .01$), Motor Encoding ($t = 2.612$, $p < .02$), Auditory-Vocal Association ($t = 3.349$, $p < .01$) and Vocal Encoding ($t = 3.031$, $p < .01$).

The experimental group showed significant growth from fall to spring in the total score ($t = 5.300$, $p < .01$), Motor Encoding ($t = 2.578$, $p < .05$), Auditory-Vocal Association ($t = 7.494$, $p < .01$), Visual Motor Sequencing ($t = 2.651$, $p < .02$), Vocal Encoding ($t = 4.207$, $p < .01$) and Auditory Vocal Sequencing ($t = 3.571$, $p < .01$). The control group showed no significant growth over the year.

Insert Tables 11 and 12

In the fall, both the experimental (M. -.43, S.D. .12) and control (M. -.14, S.D. .97) groups were below average in language skills as measured by the Illinois Test of Psycholinguistic Ability.

The change of the two groups in the total language measure in the spring differed markedly (1.47 standard score), the experimental (M. 192, S.D. 1.3) group improving impressively, and the control (M. -.19, S.D. 1.58) group staying where it was.

The areas of greatest divergence of skills in the two groups by spring were in expressive aspects of language (Vocal Encoding, Experimental group M. 1.15, S.D. 1.03; Control group M. -.36, S.D. .97), and in analogy skills (Auditory-Vocal Association, Experimental group M. 1.30, S.D. .65; Control group M. .41, S.D. .61). All subtests moved in favor of the experimental group.

In the control group, the mean change moved negatively in all but the Visual-Motor and Auditory Vocal Sequencing, but even in these subtests, the experimental group showed equivalent growth.

Intellectual Function

The Wechsler Intelligence Scale for Children and the Science Research Associates Test of Primary Mental Abilities were administered in the fall and spring of the first grade year.

Table 13 is a comparison of the scores in the fall of first grade on the WISC and SRA for the twelve youngsters in the experimental group as compared with the six in the control. In the fall, both groups' intellectual quotients were the same on the WISC (M. 110).

Insert Table 13

On the SRA test of Mental Ability, the experimental group's mean was 104.5, S.D. 6.598, as compared to mean 99.5, S.D. 4.230, in the control group.

Table 14 shows the mean change in intellectual functioning in the experimental class of 12 youngsters

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Insert Table 14

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from fall to spring of the first grade. There is significant mean change at .01 level of confidence in the WISC I.Q. score (M dif. 10.0, S.D. 7.122, t 4.863); WISC Verbal I.Q. (M dif. 9.25, S.D. 9.294, t 3.447); WISC Performance I.Q. score (M dif. 9.00, S.D. 6.619, t 4.709); WISC Similarities with range 0-20 (M dif. 2.083, S.D. 2.998, t 2.406); and WISC Object Assembly subtest (M dif. 3.416, S.D. 2.644, t 4.475). There is significant change at the .05 level of confidence in the Information, Comprehension and Picture Arrangement subtests of the WISC.

The Science Research Test of Mental Abilities shows significant change in the experimental group at the .01 level of confidence in the total I.Q. and perceptual I.Q. score and at the .05 level of confidence in the spatial I.Q. score.

In contrast, table 15 reveals significant change in the control group only in the Information subtest of the Wechsler Intelligence Scale for Children (M dif. 2.000, S.D. 1.673, t 2.927, p .05) at the .05 level of confidence. No significant change was shown in any other tests of intellectual function in the control group.

Insert Table 15

The difference of mean change between the experimental and control group from fall to spring favors the experimental group in all except Information and Coding subtests of the WISC.

Insert Table 16

Academic Performance

This function was measured by the Stanford Achievement Test and Tests of Structural Reading.

The results in academic performance at the end of first grade are unclear. Since both groups of deficit children were taught with different methods, different skills including different words, one of the standard measures of achievement success in reading, namely, the Stanford Achievement Test, could not reveal important evidence one way or the other. To counterbalance this, tests developed for mastery with the Stern "Structural Reading" approach were incorporated into the analysis of the reading achievement.

The Stanford Achievement Test and Test of Structural Reading were used to measure the academic achievement of all the groups. In the Stanford Achievement (Experimental group, M. 13.5, S.D. 4.7; Control group, M. 19.66, S.D. 8.041), the mean favored the control group in Paragraph Meaning; in the Structural Reading (Experimental group, M. 56.95, S.D. 3.646; Control group, M. 51.8, S.D. 6.9), the mean favored the experimental group in the same function. This makes sense since each used a different vocabulary, the experimental group familiar with the Structural one and the control group familiar with the developmental one used in the Stanford.

Insert Table 17

Table 17 compares the two deficit groups on their academic performance. The only significant difference in performance is in the Spelling subtest of the Stanford Achievement test with the control group performing significantly higher ($t = 2.213$, $p < .05$).

The other tests most closely approaching significant difference are the Stanford Paragraph Meaning subtest favoring the control group ($t = 2.058$, $p > .05$) and the Structural Reading Paragraph Meaning favoring the experimental group ($t = 2.004$, p .05). The Word Meaning subtest of the Stanford Achievement Test ($t = .00$) shows that both groups did equally well on that task.

It is felt that the results are meaningless at this time and only after another year, during which time the children will be exposed to a similar reading program, could differences be ascertained.

"Normal" Children

Selection Procedure

Table 18 shows no significant differences between the experimental and control "normal" groups on the Sapir Developmental Scale (c), the Marianne Frostig Test of Visual Perception and the Science Research Associates Primary Mental Abilities Tests. The scores do favor the experimental group but not at the 5% level of significance.

Insert Table 18

The New York State Reading Test is the only one with significant differences between groups at the 5% level and this difference favors the control group. It should be noted that the Frostig, SRA and New York State Readiness were administered in the fall of first grade, but the Sapir Developmental Scale (c) was administered in the kindergarten year and used for matching of children.

As was expected, the "normal" children obtained significantly higher grades in all subtests of the Stanford Achievement Test than the "deficit" children in the spring testing at the end of first grade.

Insert Table 19

In the structural reading mastery tests, only the more advanced tests of phonics revealed significant differences. Both groups learned their initial and final sounds.

Visual Perception

This function was measured in the fall and spring with the Marianne Frostig Test of Visual Perception and the Science Research Associates Mental Ability Perceptual Subtest.

In the fall the mean of both groups was similar; Frostig (experimental group, M. 107.91, S.D. 11.18; control group, M. 106.91, S.D. 14.86); SRA Perceptual subtest (experimental group, M. 111.70, S.D. 11.80; control group, M. 110.91, S.D. 14.55). In the spring the Frostig means were as follows: experimental group 114.51, S.D. 8.95, as compared to the control group 111.58, S.D. 11.71, and the SRA Perceptual subtest means were as follows: experimental group 114.83, S.D. 27.52; control group 124.74, S.D. 6.62.

Table 20 reveals that the mean differences from fall to spring are too minimal to be of any significance. The only difference approaching significance is in Form Constancy, favoring the experimental group (t = 1.709).

Insert Table 20

Table 21 shows significant growth at the .05 level in the total Frostig and Form Constancy in the experimental group. In the control group, there was significant growth in the SRA Perceptual subtest at the .05 level of significance, as shown in Table 22.

Insert Tables 21 and 22

Intellectual Function

This function was measured in the fall and spring by the Science Research Associates Test of Mental Ability - Primary Level.

The two groups showed no significant differences in their growth patterns. The one most approaching significant difference was the Spatial Relationship subtest ($t = 1.504$), with the experimental group increasing their mean score 6.250 and the control group regressing with a decrease of mean score -2.833.

Insert Table 23

In the control group, significant growth was made in the Perceptual subtest of the SRA (Mean Change 13.833; $t = 2.632$, $p < .05$).

Insert Tables 24 and 25

Academic Performance

The Stanford Achievement Test and the Structural Reading Tests measured this skill in the spring of the first year.

Table 26 shows no significant difference between the groups in achievement. The Stanford Achievement favored the experimental group and the Structural Reading Tests, with the exception of the long vowel mastery subtest (Silent E), favored the control group. Both groups were taught with the same curriculum but teacher differences in techniques and emphasis may account for some of the results.

Insert Table 26

DISCUSSION

Selection Procedures

The study has shown that with this population developmental differences were identified at the kindergarten level, persisted in the first grade and correlated significantly with the academic performance 17 months later. The Developmental Scale is now being used with a larger population and the results will be studied to see if the scores continue to correlate with academic achievement.

It must be emphasized that the Sapir Developmental Scale (c) is a survey instrument to be used with a total kindergarten population. With it children can be selected for specialized training. One of its major assets is that it is a short test, taking at most 30 minutes to administer and can eventually be used by kindergarten teachers carefully trained. In a very general way, the instrument can highlight areas of deficiency in a child and indicate the strengths or weaknesses of sensory modalities. It is hoped that with such an instrument children could be selected for "transition" (18), or "maturity" (59) classes to prevent later academic failure.

Diagnostic and Testing

Accurate testing for scoring data is essential in a research study. It became more and more apparent as the pilot study proceeded, however, that the vital contribution testing could make to the understanding of children with deficits was in terms of process rather than of score. The psychologists and teachers who work in deficit-centered training must be attuned to the child's method and style of approach, analytic and synthetic abilities, areas of stress, and compensatory and/or avoidance devices.

The intensive testing program completed in December, 1965, confirmed our original findings (derived from screening in May, 1964, and February, 1965) that these 18 children had deficits in bodily schema, perceptual-motor ability and/or language development; that these disabilities tend to sustain themselves throughout the kindergarten year and may be attributed to a multiplicity of reasons: neurological, maturational, emotional, physiological and experiential. Few children who might be classified in DeHirsch's (18) terms as "Slow Starters" no longer manifested severe handicaps by the first grade, but even in these there were residual perceptual-motor and other organizational problems.

The pilot study has contributed to our knowledge of tests frequently used to evaluate children of of this age. For this group of children, it is felt that only certain subtests of each standardized measure should be used: only those that add to our knowledge of the functioning of the child. Since the goal of psychological testing for training purposes is to isolate independent functions, only the most precisely differentiating subtests should be used. It is suggested, therefore, that in a larger study, some tests will be eliminated and others added.

The Illinois Test of Psycholinguistic Ability seems to be highly diagnostic except for three subtests: Visual Decoding, Auditory Decoding and Auditory Vocal Automatic. It is hypothesized that for the Scarsdale population of children, the ability to comprehend pictures or spoken words and to use language with correct syntax (as tested by the instrument) is fairly well developed by the first grade.

All of the subtests but one of the Hawthorne Concepts Scale proved to be of little value: the Quantity and Dimension subtest. The subtests in Number, Writing and Directionality (a test of map-orientation) seemed to be inappropriate for the six year old child. The Laterality subtest (a test of directionality as formulated in significant background) duplicates other tests which are more appropriate and give more information. The subtest on Personal Information is not diagnostic because most of the children have been so trained.

The subtest on Time was diagnostic and curriculum informative but not economic as a tool. The variability was so great that it was deemed wise to include all of these age-appropriate items in the new curriculum. Quantity and Dimension was diagnostic of estimations of comparative relationships in size, height and weight showing the child's awareness of himself and his environment. This is considered important because one of the study's main theoretical formulations relates to the child's orientation and organization of his world (33).

On the Auditory-Visual Integration Test (9), the children in the pilot study performed considerably below age level. Some could repeat the patterned sounds and did so spontaneously, but could not integrate to the visual. By the spring, eight out of twelve in the experimental group were able to integrate.

All of the Marianne Frostig subtests: Eye-motor Coordination, Figure-ground, Form Constancy, Position in Space, and Spatial Relationships, were valuable both in diagnosis and in selection of curriculum. Eleven out of the 18 children with deficits in the pilot study show deficiencies in all the Frostig subtests, except Eye-motor Coordination where nine of the children functioned below age level.

The Draw-A-Person Test (with Goodenough-Harris scoring) (27) reflects the information that the child has integrated about his body, its parts and their relationships to each other. It appears such awareness is necessary for reading. The drawing of the human figure is expected to be predictive of achievement two and one-half years hence (4).

The WISC is important to retain not only for an accurate I.Q., but for a qualitative and comparative analysis of many of the child's strengths and weaknesses. It was speculated and demonstrated that there may be an increase in the I.Q. as a result of deficit-centered training.

The Bender-Gestalt Visual Motor Test (with Koppitz scoring) (35) was found to be a valuable instrument for diagnosis of visual-motor problems and problems of organization of space. The ability to correctly perceive and reproduce configurations is required in the reading process (18). Of most interest was the change in the organizational patterns in the experimental group.

"Deficit" Children

Bodily Schema

The unusual results on the Hawthorne need some clarification. It should be noted that in a previous section of this report headed "Diagnostic and Testing," it states, "All of the subtests but one of the Hawthorne Concepts Scale proved to be of little value: the Quantity and Dimension subtest. The subtests in Number, Writing and Directionality (map orientation) seemed to be inappropriate for the six year old child." The significant difference favoring the control group in subtests Time and Directionality is puzzling and can partially be explained in viewing the emphasis in the control class on retaining information and academic achievement.

Much more puzzling and important is the data on the Harris Test of Lateral Dominance. The difference in mean change between the "deficit" groups favors the control at the .05 level of significance. The results were as follows:

Fall: Experimental class #1 - 3 children non-established
4 mixed
5 established

Control class - 5 children non-established
1 mixed

Spring: 3 of the non-established (1 from the experimental class and 2 from the control) established lateral dominance.

15 children remained unchanged.

As can be seen, two of the six children in the control group established lateral dominance as measured by the Harris Test, whereas only one of the seven in the experimental group did, even though the experimental group was exposed to many training techniques in right-left direction and body positioning. We have no idea why two children in the control group moved from non-established to established dominance. It may be a maturation function or possibly reading and writing may help or facilitate the maturation of this function. Certainly if Birch (9) is correct that laterality is not established until the age of nine well after the reading skill has been established, it might be suggested that the skills may be developed simultaneously. However, of the three children that established lateral dominance, two were making excellent progress in reading (one from the experimental and one from the control group), but one child in the control group continued to have severe problems in learning to read.

A comparison of these findings with those of Dr. Gold's indicates that of the 16 cases, eleven had similar findings to the Harris Test and five did not.

By the spring, the children in the experimental group had developed a good sense of directionality but this was not translated into lateral function. This may be an artifact of the instruments used or a developmental function least susceptible to change.

Qualitatively is noted the change in the increased size of head (larger than the body) in the control group as contrasted to the experimental. Since it has been theorized that the increased size of head is suggestive of "minimal brain damage," the different performance in two groups with similar neurological findings should be noted. Consideration might be given to an alternate suggestion that increased exposure to academic work (as evidenced in control group) caused more confusion and led to increased feelings of inadequacy in the mental sphere and more instability. Research is much needed in this area.

Perceptual-Motor Function

The trends suggest that special training in perceptual-motor skills may foster growth in this function at this age level. The progress in visual motor organization and auditory-visual integration is important.

Birch (8) postulates that the source of difficulty in reading retardation is the cross-modal transfer of information from the auditory to the visual modality. The difficulty may lie in conceptualization requiring symbolic mediation (verbal labels). The present study involved training only in the auditory modality by the use of verbal mediation and made no attempt whatsoever to train children to integrate the auditory to the visual. It was postulated that if the children made substantial gains on the Auditory-Visual Integration Test, it would suggest that symbolic mediation may be the source of difficulty and the best means of training such deficiencies. Training was effected by presentation of tapping patterns. The children were asked to verbally emulate the patterns with the words "run" for fast patterns and "walk" for slow patterns. They listened to the pattern presented and then repeated the pattern with the words; for example, "walk-walk-run" or later with a more lengthy pattern "run-run-walk-walk." Only after the verbalization was agreed upon and repeated by the group were the children permitted to tap out the patterns. The words "walk" and "run" were used because they best emulated the language used in rhythmic body training yet were meaningful and simple. The training was given in five-minute intervals about twice a week for three months. The control group received no such training. The statistically significant gain (t = 3.175) at more than the 1% level of confidence in the experimental group was particularly interesting in view of the lack of training in cross modality. The findings tend to substantiate the need for symbolic mediation as a help in conceptualization for children who have difficulty in temporal organization. The children were able to transfer the information from the auditory to the visual modality once they were able to conceptualize the temporal organization symbolically.

No attempt is made to isolate those aspects of the curriculum which deal with perceptual functioning. Perceptual deficits were pinpointed by psychological testing and then interpreted to the teacher for work with the children according to their individual needs with a variety of techniques. The present investigators developed all aspects of the curriculum with the basic educational viewpoint that deficit children need training in organizing their environment and in integrating visual training with other modalities and with cognition. The results obtained must be viewed with an eye to this multi-factored approach. This investigation obviously, therefore, cannot factor out those aspects of training which were responsible for the alleviation of deficits; it is believed, indeed, that visual perceptual training in isolation might very well not have reaped the encouraging results. Rather as suggested by Birch's work, the structured environment and integrative and organizational training as well as sensory training according to need were interdependent, bringing about the desired results.

The present investigators do not take the position, however, that reading instruction need be delayed while such specialized training takes place. At this point, we make only an educated guess that proper reading instruction could probably be used as part of the total curriculum to stimulate perceptual and integrative functioning. The trends do suggest that the visual perceptual function can be stimulated, as described, for greater growth. The progress in perceptual organization, as measured by our tests, appears important.

There is need for a study with a larger sample to ascertain if comparable results would be obtained and to see if such results would be maintained for a period of years. If so, the implication for education is clear. Children with "deficits" in perception need a special curriculum with emphasis on needed sensory stimulation, a structured environment, and training in organization and integration in the early grades. The trends suggest that special training in perceptual-motor skills may foster growth in this function at this age level. The progress in visual-motor organization and auditory-visual integration is important.

Language Development

The growth in the expressive aspects of language in the experimental group is important. We know that the primary grades are a period of rapid growth in this function for many children, but the significant differences between the groups in motor encoding and vocal encoding suggests a direct relationship between training and performance. The body training and imitation of gestures and body positions from story book pictures and teacher and children models, in the experimental group only, suggests that the children who were deficient had a better ability to respond after training. The children whose daily program consisted mainly of academic work (reading, writing and arithmetic) were less able to perform in the spring. The same appears true of Vocal Encoding and Auditory-Vocal Association where language training in the experimental group consisted of the development of classification, categories and the relationships of concepts.

Intellectual Function

Our hypothesis has been confirmed. The intellectual function (as measured by the WISC and SRA) of the children in the experimental class was enhanced. More growth has taken place in the experimental group in perceptual and spatial organization, communication skills and the analytic and synthetic thought processes that enter into the intelligent quotient score.

In the WISC, subtests Comprehension, Similarities, Vocabulary, Picture Arrangement and Object Assembly showed the most change. When emphasis is placed on the training of developmental functions, an increase in intellectual ability results.

Present methodology for developmentally "deficit" children has generally followed the principles developed for classes of brain damaged youngsters. Sensory stimulation has been cut to a minimum because of its distractible quality. We have attempted to show that these developmentally "deficit" youngsters are in need of a specially organized sensory experience with its goal, the integration of the sensory modalities. Training was offered not in isolation but in a group experience to stabilize perceptual representation in space, time and intensity so that children not only learn to discriminate but also learn modes of coding the environment, setting up category memberships which result in perceptual analysis and synthesis.

There is awareness that there were many uncontrolled factors (teacher variability and difference in the number of subjects) which may contaminate the results. It is not possible to ascertain which part of the program offered was the most significant but wherever it was possible, variables were controlled. Many materials were eliminated because it was felt that they trained specifically for the intelligence tests. The data is obviously not conclusive with such a small sample, but there are indications that with a larger sample, if differences are maintained, the findings would be even more dramatic.

We agree with Vigotsky (60) when he accords meaningful instruction a structural role. A basic characteristic of any structure is its independence and its translation to other media. Once a child has formed a certain structure or learned a certain operation, he will be able to apply it in other areas. We have given him a pennyworth of instruction and he has gained a small fortune in development. "Since instruction given in one area can transform and reorganize other areas of child thought, it may not only follow maturing . . . but also precede it and further its progress." (60)

Academic Performance

Any definitive evidence in academic achievement results, particularly reading, is deemed inappropriate at the end of the first year for the following reasons:

1. Emphasis in the experimental group and the theoretical assumption underlying it requires that most of the time be spent on training developmental skills rather than academic ones.

2. Methodology was unique in each group. Experimental group built from the discrete unit to the larger (letters to words); control group from the global sight word approach to the discrete sounds. (Spaulding [60 sounds of English] Writing Road to Reading.)

3. Children were tested on reading material which they had never learned.

4. An example of contrasts is to be seen in the results of the two paragraph meaning tests. Depending on which reading vocabulary had been taught in which group, that group excelled.

"Normal" Children

Although the argument continues to persist as to the value of heterogeneous versus homogeneous grouping, little could be learned from the data to favor one organizational grouping over the other.

There was no significant mean change difference in either intellectual or academic achievement between the groups. This was particularly interesting since the New York State Readiness Test favored the control group (normal children placed in the heterogeneous class) at better than the 5% level of significance. As the Sapir Developmental Scale (c) evenly matched the "normal" children in the two groups, it might be a better predictor of academic performance. Of course many other variables such as teacher personality and parental attitudes influence the group.

The scores in the achievement and perceptual tests tend to favor the experimental class which included only "normal" children. The results favored the control group (heterogeneous) on the SRA Perceptual and Spatial Relationship subtests only. It is difficult to account for this, but one suggestion might be the added emphasis in the control group on phonics and writing with more time spent on reading aloud in the experimental group.

These researchers would conclude that for "normal" children, grouping or differences in technique matter very little as the children are self-motivating and select from the environment those factors that help them integrate the learning experience.

CONCLUSIONS, IMPLICATIONS and RECOMMENDATIONS

Development proceeds from a state of globality to a state of increasing differentiation, articulation and hierarchic integration (62). Werner (61) felt that an analysis of learning deficiencies needs the "intense application of concepts and methods which general, experimental and genetic psychology have developed," that purely mechanical analysis of elements and then specific training are not sufficient. An investigation of the elements themselves, their interrelationships and their relationship in the hierarchical organization as a whole is necessary. Deficits were not discrete to each other but were related to the total organization of the person. Where there is immature development, many functions are influenced and in different children, different functions are attacked and to a different degree.

In our culture, children differentiate perceptual, body and language skills sufficiently by the age of five to do predictive testing (18). Many children are influenced by uneven and immature development. The deficit children had deficiencies in a number of different areas. In different children, different areas are affected. No two deficit children had identical patterns.

The wide variations in developmental deficiencies and their complex interrelationships in the total child dramatically point up the difficulties that educators face as they attempt to program for such a group of children. While training in specific deficit areas has importance, the most vital part of any program for these "deficit" children must be the structuring and organization of the environment in such a way to compensate for the child's diffuseness and the imparting of appropriate means to the child so that he can learn to organize himself. By and large, attempts to train in specific tasks without consideration for the logical operations involved may not have lasting benefit for the child. Instruction must be meaningful so that it can achieve independence from its original substance and thereby be translated to other media (60). Once a child has formed a certain structure, he will be able to apply it in other areas. Since instruction given in one area can transform and reorganize other areas of child thought, it may not only follow maturation but also precede it and further its progress.

It is remarkable that even with such a small sample, significant gains were established in the experimental "deficit" group in intelligence, visual perception, auditory-visual integration and language. Insignificant differences in the academic achievement is considered a positive finding because in the experimental "deficit" group so much of the school day was spent on other aspects of the curriculum (training in bodily schema, perceptual-motor and language skills) as contrasted to a full day spent on reading, writing and arithmetic in the control group. A proper evaluation of academic performance will be completed at the end of the second grade. It is nevertheless the position of these researchers that the teaching of reading should not be delayed; that reading taught properly helps develop the perceptual and language skills and that in our culture, the child's ability to learn to read is related to his own self concept and the way he is seen by his peers and family.

Although the argument continues to persist as to the value of heterogeneous versus homogeneous grouping, little could be learned from this research in this regard. Very little difference was seen in either intellectual or academic achievement between the "normal" groups. This was particularly interesting since the New York State Readiness Test favored the control group or heterogeneous class at more than the 5% level of significance. It is suggested that the developmental tests which evenly matched the groups might be better predictors of academic performance and/or that teacher-parent variables influence the group dramatically, especially at this grade level.

The pilot study has served as an exploration in teacher diagnosis, techniques and curriculum materials. A guide is being developed to aid in building new learning experiences, methodology and different materials or rote practices for each child. This may be used as a basis for much needed further research in our public schools.

Certain skills we now know are trainable such as right-left directionality and knowledge of body parts as related to body movement. There is a need to distinguish between left-right awareness in body movement and directionality on a two dimensional plane, and to explore whether left-right awareness in body movement will facilitate left-right awareness in learning to read.

In the analysis of responses to vocabulary meanings, it becomes apparent that the quality of the response is more important than the score. A quantitative vocabulary scale (47) is suggested as follows: 1) categorization, 2) essential description, 3) essential function, 4) function, 5) vague description or function, 6) error or don't know. Since there are suggestions that higher levels of vocabulary development may be correlated to academic achievement, attempts should be made to train the use of language and the ability to expand one's mastery of verbal communication. Consideration must also be given to the development of thought processes.

Training in verbal mediation has been found to be of help in the development of auditory and visual discrimination. For example, children imitating tapping patterns can be helped with verbal aids as "run-run-walk" or a child copying a design on a pegboard may be guided with words to make the right visual-motor response eliminating trial and error.

In-service teacher training programs are needed to pinpoint many skills that must be developed for successful teaching. From an understanding of the child's deficits, techniques can be built that can serve as a basis for training each youngster. In addition, disabilities and assets of the child can be picked up through therapeutic trials or trial lessons. If the child learns, and he often does, then the teacher knows how to proceed. The teacher must become aware of the child's style, analytic ability and compensatory devices. She needs to look for clues from the child.

Problems confront teachers of such experimental classes. They tend to become very immersed in the problems of each youngster and find it very difficult to remain apart. The teachers reported that they stayed up many nights thinking, planning and worrying about these youngsters. It was expressed in these words, "This is the hardest job I have ever had but I will never forget these children." In addition, the teachers' lack of theoretical background in this field and their teacher training which had emphasized permissiveness, stimulation and great variation of program make for ambivalent feelings. It is difficult for teachers trained to think of all learning disability as emotionally based to be now confronted with a new set of developmental principles.

An important recommendation, then, is a re-evaluation of all teacher training programs with the introduction of some new courses on developmental principles and learning disabilities.

The need for further research is self-evident. There is need for a similar project with a larger sample where an attempt could be made to isolate each variable; particularly class size, class organization and curriculum. If with a larger sampling, and a larger number of teachers, the results can be duplicated, and if one could determine which one of the three variables was most significant, a real contribution could be made to education.

It is hoped that with the dissemination of the information other neighboring communities would learn to see this program as a preventative approach to serious academic disabilities and that for some children, a "soft" start in a "transitional" or "maturity" class with special deficit centered training in areas of weakness might be a prelude to a successful academic experience. It would be hoped that some schools would see the need for such classes within the normal school setting.

It is further suggested that after the completion of this research, a similar approach might be investigated in our urban centers where problems are linked to many of the same factors we have been discussing.

It is also hoped that in some ways, teachers might be trained to observe children with an eye to finding clues to their method of learning. In-service techniques may also contribute to our knowledge and these techniques may also be disseminated.

SUMMARY

Learning problems remain the most important challenge to educators. Can predictive tests be used at the four and five year age to select those children who will have difficulty learning? If the children are selected, can programs be developed that will alleviate the problem? Specifically, if developmental problems are predictive, can training stimulate and foster growth developmentally and intellectually and will this be reflected in more academic achievement?

To test these hypothesis, the Sapir Developmental Scale (c) was used to select and predict children's learning disabilities.

The children were tested in three major areas; perceptual-motor, bodily schema and language development. Eighteen children out of 54 were selected with the following criteria: below 60 score on the Sapir Developmental Scale (c) and deficit in two of three functions mentioned above. These 18 children were then matched by criteria, sex and chronological age in groups of three with one of the three acting as a control. Twelve of the 18 deficit youngsters were placed in one segregated class and given an experimental curriculum emphasizing training in bodily schema, perceptual-motor skills and language. Reading and arithmetic were integral parts of the curriculum, but used a "structural" approach to the content and stressed the philosophy that for these children, emphasis should be placed on the "discrete" unit, building bit by bit to the whole concept. The theoretical emphasis underlying the curriculum was one which believed that children needed organizational and integrative training. Rather than isolation or a diminuation of stimulation, the sensory stimuli must be presented in such a way to help the child efficiently organize and integrate the input.

The six control children matched with the twelve experimental children were placed in a class with twelve "normal" children and offered the standard enriched developmental reading, arithmetic and language arts program in Scarsdale. Of the 36 normal children, they were matched in groups of three by score, chronological age and sex, and one of the three were placed in the control group with the six "deficit" children. The mixed group of twelve normal and six deficit children

became the control of the other two classes, one with twelve deficit children, one with 24 normal children. The children were tested in the fall and spring of the first year with a psychodiagnostic battery of tests. The difference of mean change from fall to spring was measured statistically between the two deficit groups and the two normal groups using all the test data.

The results clearly favored the experimental group with the deficit children and the major and dramatic differences were in the following areas: language development with special emphasis on expressive language and concepts, the perceptual-motor function with important changes in the visual perceptual function, the auditory-visual integration and the organizational patterns of perceptual-motor development as evidenced by the change in the Bender-Gestalt patterns; the intellectual function with significant statistical changes upward in the WISC I.Q. score. The academic achievement at the end of first grade showed no important differences. This was not unexpected because of the emphasis in the program but also because it was felt that one year was too soon to determine whether any important differences would emerge. This should be studied over a period of three years.

On the whole, there was little difference between the "normal" groups with the experimental 24 children performing slightly better than ones in the mixed group. These differences were too small to be of any importance. One can only conclude that with such a small sample, it appears that with normally developing children, class organization has very little influence on the child's learning patterns.

The implication of the findings for the "deficit" children appears highly significant. It is obviously too soon to generalize from so small a sample, but if such significant growth can be made in these children in one year, it would seem imperative that a larger research project be initiated to see if these results can be duplicated with a variety of classes and teachers. The findings seem important enough to suggest that in large numbers of our public school population, for varying reasons children will not learn to read, write, understand and develop concepts unless there is provided some program of intervention at the four, five, six and seven year levels of education. If such "maturity" classes could stress developmental and organizational training, then possibly large numbers of our presently diagnosed "learning problems" could have a successful academic experience.

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Appendix A

SAPIR DEVELOPMENTAL SCALE (c)

I. Visual Discrimination

a. Child asked to match 4 forms (Fig. 1) on a card with 6 forms on it. Say, "Look at this and find it here."

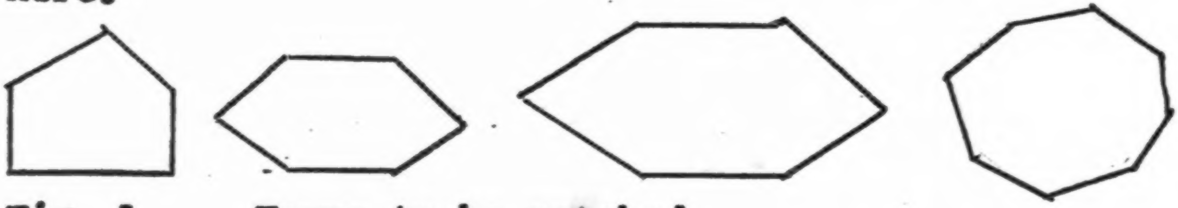

Fig. 1 Forms to be matched

b. Instruct in advance, "I am going to show you some letters. Tell me if they are the same or different." Show child one card at a time with following pairs on each:

ball	horse	come	toy	big
ball	house	came	toy	dog

c. Say, "This paper has some triangles on it. Do you know what a triangle is? (Show triangle). Find all the triangles. Trace or go around the lines that make them triangles."

II. Visual Memory

a. Forms (Fig. 2) shown for 5 seconds, then removed. Child asked to identify form from card with 6 designs.

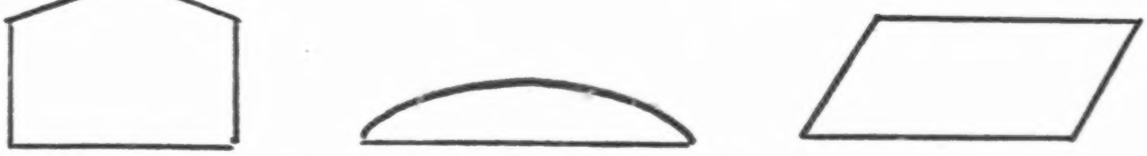

Fig. 2 Forms to be identified from memory

b. Forms (Fig. 3) shown for 5 seconds, then removed. Say, "Look at this. When I take it away I am going to ask you to draw it for me."

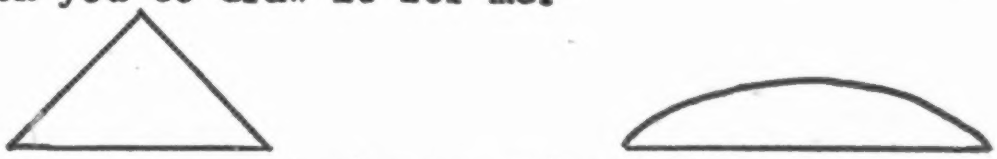

Fig. 3 Forms to be reproduced from memory

III. Auditory Discrimination

Say, "I am going to say some words. Am I saying the same words or different words?"

IV. Auditory Memory

a. Say, "Listen carefully and say what I say."

Repeat: 371 4538 91672
528 7381 02423

b. Say, "Now we will have fun with the numbers and say them backwards. If I say 1-2-3, you say 3-2...."

Repeat backwards:

52 574 6392
73 357 1742

c. Say, "Now I am going to tap on the table with a pencil. Listen carefully and you tap the same way after I have finished."

Repeat tapping rhythms:

1. . ...
2. .. ..
3. .... .
4. .. ...

V. Visual Motor

Copy a circle, triangle and diamond. Draw two horizontal parallel lines. Cut out a circle.

VI. Directionality/Laterality

a. Right-Left directionality.

Eyes open show me your:

1. right hand
2. left eye
3. put right hand to left eye
4. put left hand to left ear

Eyes closed:

1. put left hand to right eye
2. put right hand to right ear

b. Laterality.

Record:

Eyedness ________

Handedness: Pencil________
Scissor________
Throw ball________

Thumbedness ________

Footedness ________

VII. Orientation

a. How old are you? ________
b. When is your birthday? ________
c. What do birds move when they fly? ________
d. What is a small child called? ________
e. What is the color of snow? ________
f. Is it day or night? ________
g. Which is smaller, a baby or a kitten? ________
h. What day is today? ________

VIII. Visual-Motor Spatial Relationships

Child copies designs developed by White & Phillips (63). Fig. 4.

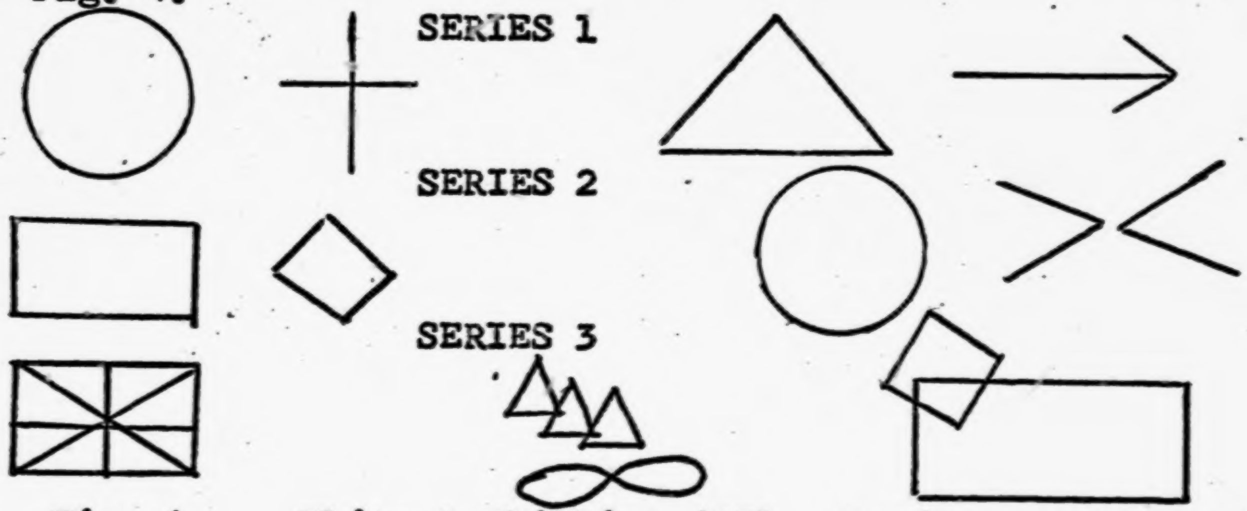

Fig. 4 White & Phillips (63) Designs to be copied

IX. Body Image

a. Draw-A-Person test.

b. Say, "Show me your ear, knee, wrist, elbow, waist and ankle.

X. Vocabulary

What is a (an):

a. Orange ______________________
b. Envelope ______________________
c. Straw ______________________
d. Puddle ______________________
e. Tap ______________________
f. Gown ______________________
g. Roar ______________________
h. Eyelash ______________________
i. Mars ______________________
j. Juggler ______________________

APPENDIX B

Table 1

Comparisons of Performance for 36 Normal and 18 Deficit Children

Test	Normal		Problem			
	Mean	S.D.	Mean	S.D.	t	p
Sapir Developmental Scale	69.055	8.414	50.0	9.029	7.657	<.01
Perceptual-Motor	30.916	2.567	24.22	4.73	6.74	<.01
Bodily Schema	24.750	6.917	14.22	5.934	5.515	<.01
Language	13.388	1.271	11.555	1.916	4.198	<.01
N.Y. State Readiness	77.722	7.901	62.722	7.729	6.622	<.01
Marianne Frostig Test of Visual Perception	107.583	12.327	94.388	12.834	3.657	<.01
Eye-hand	9.55	1.63	8.54	1.85	4.59	<.01
Figure Ground	10.75	2.12	8.79	2.59	4.17	<.01
Form Constancy	10.72	2.66	8.70	3.13	4.29	<.01
Position in Space	11.2	2.22	9.08	2.02	10.6	<.01
Spatial Relationships	11.33	1.72	9.87	1.20	2.80	<.01
SRA Mental Abilities	111.027	7.205	102.833	6.270	4.105	<.01
Perceptual	111.30	13.17	107	11.40	2.43	<.02
Spatial Relationships	106.05	12.87	93.79	9.43	3.56	<.01

Table 2

Correlations Between Sapir Developmental Scale and New York State Readiness and Marianne Frostig Tests of Visual Perception with 54 Children

Test	Total Sapir Scale		Perceptual-Motor Sapir Scale		Bodily Schema Sapir Scale		Language Sapir Scale	
	r	p	r	p	r	p	r	p
N.Y. State Readiness	.6598	<.001	.6566	<.001	.5337	<.001	.4369	<.01
Word Meaning	.2209		.2442		.1465		.2342	
Listening	.2742	<.05	.2489		.2095		.3044	<.05
Matching	.6348	<.001	.5094	<.001	.5964	<.001	.3554	<.02
Alphabet	.5330	<.001	.4792	<.001	.4784	<.001	.2660	
Numbers	.0273		.1631		.0710		.0964	
Copying	.5749	<.001	.5483	<.001	.5038	<.001	.2606	
Marianne Frostig Test of Visual Perception	.4474	<.001	.3129	<.05	.4703	<.001	.1366	
Eye-hand	.4646	<.001	.3784	<.01	.4543	<.001	.1605	
Figure Ground	.4522	<.001	.3379	<.02	.4480	<.001	.2105	
Form Constancy	.2692		.1641		.3052	<.05	.0409	
Position in Space	.1645		.0837		.2017		-.0026	
Spatial Relationships	.4855	<.001	.3477	<.02	.4879	<.001	.2332	

Table 3

Comparisons of Matched Groups

	Children With Problems Class #1	Children With Problems Class #2	Children Without Problems Class #2	Children Without Problems Class #3
Tests Administered to Total Population				
New York State Readiness	60.5	67.1	81.75	80.04
Frostig Test of Visual Perception	95.5	92.16	107	108
SRA Mental Ability	104.5	99.5	110.5	111.3
Tests Administered to Children with Problems				
ITPA	-.4	-.14		
Bender Gestalt	11.25	14.17		
Hawthorne Concepts	78.6	79.5		
Birch Auditory Visual Integration	3.75	4		
Draw-A-Person Test	85.75	82.33		

Table 4

Mean Change in Experimental Group "Deficit" Children from Fall to Spring in Bodily Schema

N=12

Test	Mean Change	S.D.	t	p
Harris Laterality	.166	.577	.999	
Hawthorne Total	8.583	8.360	3.556	<.01
Information	1.250	2.667	1.623	
Quantity and Dimension	1.833	2.790	2.275	
Number	1.166	3.270	1.235	
Directionality	.166	2.657	.217	
Writing	2.916	3.260	3.099	<.01
Laterality	.416	4.209	.342	
Time	.833	1.749	1.650	
DAPT	5.750	10.163	1.959	

Table 5

Mean Change in Control Group "Deficit" Children from Fall to Spring in Bodily Schema

N=6

Test	Mean Change	S.D.	t	p
Harris Laterality	1.333	1.366	2.390	
Hawthorne Total	5.500	7.661	1.758	
Information	.833	2.041	1.000	
Quantity and Dimension	1.000	2.449	1.000	
Number	-1.166	2.483	-1.150	
Directionality	1.666	1.032	3.952	<.05
Writing	2.500	3.619	1.691	
Laterality	-1.333	4.226	- .772	
Time	2.000	1.095	4.472	<.01
DAPT	2.166	9.020	.588	

Table 6

Differences in Mean Change Between Experimental and Control Groups with "Deficit" Children in Bodily Schema

Test	Experimental Group N=12		Control Group N=6		t
	Mean Change	S.D.	Mean Change	S.D.	
Harris Laterality	.166	.577	1.333	1.366	-2.588
Hawthorne Total	8.583	8.360	5.500	7.661	.756*
Information	1.250	2.667	.833	2.041	.334*
Quantity and Dimension	1.833	2.790	1.000	2.449	.519*
Number	1.166	3.270	-1.166	2.483	1.531*
Directionality	.166	2.657	1.666	1.032	-1.317
Writing	2.916	3.260	2.500	3.619	.246*
Laterality	.416	4.209	-1.333	4.226	.830*
Time	.833	1.749	2.000	1.095	-1.481
DAPT	5.750	10.163	2.166	9.020	.729*

*Favors experimental group

Table 7

Mean Change in Experimental Group "Deficit" Children from Fall to Spring in Perceptual-Motor Skill

N=12

Test	Mean Difference	S.D.	t	p
Frostig	19.416	7.704	8.730	.01
Eye-hand	2.833	2.037	4.817	.01
Figure-ground	3.416	3.502	3.379	.01
Form constancy	2.416	3.941	2.123	
Position in space	1.916	2.065	3.214	.01
Spatial relationship	1.500	1.167	4.449	.01
S.R.A. Mental Ability Perceptual Subtest	19.916	14.374	4.799	.01
Bender-Gestalt	6.583	3.476	6.560	.01
Birch Auditory-Visual Integration	2.250	2.454	3.175	.01

Table 8

Mean Difference in the Control Group "Deficit" Children from Fall to Spring in Perceptual-Motor Skill

N=6

Test	Mean Difference	S.D.	t	p
Frostig	-5.333	12.307	-1.061	
Eye-hand	-1.166	2.714	-1.052	
Figure-ground	-1.166	1.940	-1.472	
Form constancy	.500	4.037	.303	
Position in space	-2.000	3.405	-1.438	
Spatial relationship	.166	.983	.415	
S.R.A. Mental Ability Perceptual Subtest	-9.833	22.355	-1.077	
Bender-Gestalt	4.166	3.188	3.200	<.01
Birch Auditory-Visual Integration	- .333	3.011	- .271	

Table 9

Differences in Mean Change Between Experimental and Control Groups with "Deficit" Children in Perceptual-Motor Skills

Test	Experimental Group N=12 Mean Change	Experimental Group N=12 S.D.	Control Group N=6 Mean Change	Control Group N=6 S.D.	t	p
Bender-Gestalt	+ 6.583	3.476	+4.166	3.188	+1.426*	
Birch Auditory-Visual	+ 2.250	2.454	+ .333	3.011	+1.451*	
Frostig	+19.416	7.704	+5.333	12.307	+3.000*	<.01
Eye-hand	+ 2.833	2.037	+1.166	2.714	+1.467*	
Figure Ground	+ 3.416	3.502	+1.166	1.940	+1.451*	
Form Constancy	+ 2.416	3.941	- .500	4.037	+1.468*	
Position in Space	+ 1.916	2.065	+2.000	3.405	- .065	
Spatial Relationship	+ 1.500	1.167	- .166	.983	+2.993*	<.01
S.R.A. Mental Ability Perceptual Subtest	+19.916	14.374	+9.833	22.355	+1.167	

*Favors experimental group

Table 10

Differences in Mean Change Between Experimental and Control Groups with "Deficit" Children in Language Development

Test	Experimental Group N=12 Mean Change	Experimental Group N=12 S.D.	Control Group N=6 Mean Change	Control Group N=6 S.D.	t	p
ITPA Total	1.447	.945	-.050	.900	3.213	.01
Visual Decoding	- .095	.565	-.110	1.169	.037	
Motor Encoding	.653	.877	-.505	.906	2.612	.02
Auditory-Vocal Association	.952	.440	.005	.773	3.349	.01
Visual Motor Sequencing	.627	.819	.658	.722	- .077	
Vocal Encoding	1.108	.912	-.283	.930	3.031	.01
Auditory-Vocal Sequencing	.741	.719	.416	.679	.919	
Visual Motor Association	.331	1.136	-.003	1.041	.604	

Table 11

Mean Change in Experimental Group "Deficit" Children from Fall to Spring in the Language Function

N=12

Test	Mean Change	S.D.	t	p
ITPA Total	1.447	.945	5.300	<.01
Visual Decoding	.095	.565	.581	
Motor Encoding	.653	.877	2.578	<.05
Auditory-Vocal Association	.952	.440	7.494	<.01
Visual Motor Sequencing	.627	.819	2.651	<.05
Vocal Encoding	1.108	.912	4.207	<.01
Auditory-Vocal Sequencing	.741	.719	3.571	<.01
Visual-Motor Association	.331	1.136	1.011	

Table 12

Mean Change in Control Group "Deficit" Children from Fall to Spring in the Language Function

Test	Mean Change	S.D.	t
ITPA Total	-.050	.900	.135
Visual Decoding	-.110	1.169	.230
Motor Encoding	-.505	.906	1.364
Auditory-Vocal Association	-.005	.773	.015
Visual-Motor Sequencing	.658	.722	2.231
Vocal Encoding	-.283	.930	
Auditory-Vocal Sequencing	.416	.679	1.501
Visual-Motor Association	-.003	1.041	.007

Table 12

Mean Change in Control Group "Deficit" Children from Fall to Spring in the Language Function

Test	Mean Change	S.D.	t
ITPA Total	-.050	.900	.135
Visual Decoding	-.110	1.169	.230
Motor Encoding	-.505	.906	1.364
Auditory-Vocal Association	-.005	.773	.015
Visual-Motor Sequencing	.658	.722	2.231
Vocal Encoding	-.283	.930	
Auditory-Vocal Sequencing	.416	.679	1.501
Visual-Motor Association	-.003	1.041	.007

Table 13

Comparisons of Intellectual Functioning in Both Groups in Fall
"Deficit" Children

Test	Experimental (12 children)		Control (6 children)		
	Mean	S.D.	Mean	S.D.	t
WISC Total	110.833	10.373	110.666	11.843	.030
Verbal	113.083	13.200	108.166	10.647	.789
Performance	106.250	10.523	110.666	15.095	-.727
SRA Total	104.500	6.598	99.500	4.230	1.677

Table 14

Mean Change in Intellectual Functioning from Fall to Spring Experimental Class of 12 Youngsters

Test	Mean Difference	S.D.	t	p
WISC Total I.Q.	10.00	7.122	4.863	<.01
Verbal I.Q.	9.250	9.294	3.447	<.01
Performance I.Q.	9.000	6.619	4.709	<.01
Information I.Q.	1.750	2.179	2.781	<.05
Comprehension I.Q.	1.833	2.587	2.454	<.05
Arithmetic I.Q.	.666	2.806	.822	
Similarities I.Q.	2.083	2.998	2.406	<.01
Vocabulary I.Q.	1.083	2.020	1.857	
Picture Completion I.Q.	.583	2.151	.939	
Picture Arrangement I.Q.	2.416	3.342	2.504	<.05
Block Design I.Q.	- .166	3.379	- .170	
Object Assembly I.Q.	3.416	2.644	4.475	<.01
Coding I.Q.	.916	2.539	1.250	
SRA Total I.Q.	8.750	5.956	5.088	<.01
Verbal I.Q.	15.083	33.738	1.548	
Perceptual I.Q.	19.916	14.374	4.799	<.01
Number I.Q.	13.333	33.979	1.359	
Spatial I.Q.	5.333	6.840	2.700	<.05

Table 15

Changes in Intellectual Functioning from Fall to Spring Control Group of 6 Youngsters

Test	Mean Difference	S.D.	t	p
WISC Total	2.333	7.941	.719	
Verbal	1.833	7.026	.639	
Performance	3.666	12.675	.708	
Information	2.000	1.673	2.927	<.05
Comprehension	- .333	1.366	- .597	
Arithmetic	- .333	2.338	- .349	
Similarities	.500	2.810	.435	
Vocabulary	- .833	1.940	-1.051	
Picture Completion	- .666	2.065	- .790	
Picture Arrangement	.500	2.880	.425	
Block Design	- .666	1.366	-1.195	
Object Assembly	1.500	4.370	.840	
Coding	2.000	3.464	1.414	
SRA Total	7.333	9.136	1.966	
Verbal	10.500	12.692	2.026	
Perceptual	9.833	22.355	1.077	
Number	9.333	9.667	2.364	
Spatial	-1.166	7.222	- .395	

Table 16

Difference of Mean Change Between the Experimental and Control Group From Fall to Spring in the Intellectual Function

	Experimental (12 Children)		Control (6 Children)		
Test	Mean	S.D.	Mean	S.D.	t
WISC Total	10.00	7.122	2.333	7.941	2.075
Verbal	9.25	9.294	1.833	7.026	1.714
Performance	9.00	6.619	3.666	12.675	1.190
Information	1.750	2.179	2.00	1.673	- .245*
Comprehension	1.833	2.587	- .333	1.366	1.902
Arithmetic	.666	2.806	- .333	2.338	.749
Similarities	2.083	2.998	.500	2.810	1.076
Vocabulary	1.083	2.020	- .833	1.940	1.920
Picture Completion	.583	2.151	- .666	2.065	1.176
Picture Arrangement	2.416	3.342	.500	2.880	1.195
Block Design	- .166	3.379	- .666	1.366	.344
Object Assembly	3.416	2.644	1.500	4.370	1.167
Coding	.916	2.539	2.000	3.464	- .757*
SRA Total	8.750	5.956	7.333	9.136	.398
Verbal	15.083	33.738	10.500	12.692	.317
Perceptual	19.916	14.374	9.833	22.355	1.167
Number	13.333	33.979	9.333	9.667	.278
Spatial	5.333	6.480	1.166	7.222	1.867

*Favors control group

Table 17

Differences in Mean Between Experimental and Control Groups with "Deficit" Children in Achievement Tests

	Experimental Group N-12		Control Group N-6		
Test	Mean	S.D.	Mean	S.D.	t
Standard					
Achievement	-140.583	-28.008	-145.166	-30.056	+ .319*
Word meaning	20.000	- 4.472	- 20.000	- 5.019	-0.000
Paragraph meaning	13.500	- 4.776	- 19.666	- 8.041	+2.058*
Vocabulary	- 22.083	- 3.752	- 19.000	- 3.346	-1.698
Spelling	- 7.250	- 4.474	- 12.333	- 4.844	+2.213*
Word study	- 39.333	- 7.475	- 38.833	- 7.082	- .135
Arithmetic	- 38.416	-12.507	- 35.333	-12.011	- .499
Structural					
Reading Total	- 88.666	-10.508	- 91.500	- 7.063	+ .592*
Initial sounds	- 24.750	- .621	- 24.666	- .816	- .242
Final sounds	- 18.833	- 2.081	- 17.666	- 2.338	-1.077
Sight words	- 19.750	- 2.800	- 21.666	- .816	+1.620*
Silent E	- 12.083	- 3.287	- 11.500	- 3.146	- .359
Blends	- 13.250	- 3.792	- 16.000	- 2.097	+1.638*
Structural Reading Paragraphs	- 56.750	- 3.646	- 51.833	- 6.911	-2.004

*Favors experimental group

Table 18

Differences in Mean Between Experimental and Control Groups with "Normal" Children in the Fall

Test	Experimental Group N=24 Mean	S.D.	Control Group N=12 Mean	S.D.	t
Sapir Developmental Scale	70.500	7.354	66.166	9.925	1.481*
Perceptual Motor	31.125	2.755	30.500	2.195	.683*
Bodily Schema	25.833	5.730	22.583	8.712	1.344*
Language	13.541	1.382	13.083	.996	1.020*
N.Y. State Readiness	75.708	8.024	81.750	6.121	-2.290
Frostig	107.916	11.189	106.916	14.865	.226*
SRA	111.291	6.766	110.500	8.306	.306*

*Favors experimental group

Table 19

Differences in Means in Achievement Between 18 "Deficit" Children and 36 "Normal" Children

Test	"Deficit" Group N=18 Mean Change	S.D.	"Normal" Group N=36 Mean Change	S.D.	t	p
Stanford Achievement	142.111	27.896	200.472	22.919	-8.199	<.01
Word Reading	20.000	4.511	27.888	5.064	-5.588	<.01
Paragraph Meaning	15.555	6.536	30.000	6.178	-7.945	<.01
Vocabulary	21.055	3.826	25.000	5.076	-2.904	<.01
Spelling	8.944	5.092	18.194	2.011	-9.573	<.01
Word Study	39.166	7.139	48.444	4.010	-6.130	<.01
Arithmetic	37.388	12.078	50.944	6.828	-5.280	<.01
Structural Reading	89.611	9.381	95.611	16.997	-1.391	
Initial Sounds	24.722	.669	24.194	4.149	.532	
Final Sounds	18.444	2.175	18.444	3.417	0.000	
Sight Words	20.388	2.476	21.333	3.664	- .984	
Silent E	11.888	3.160	15.083	3.516	-3.250	<.01
Blends	14.166	3.518	16.833	3.075	-2.862	<.01
Structural Paragraph Meaning	55.111	5.323	58.305	10.541	-1.206	

Table 20

Differences in Mean Change from Fall to Spring Between Experimental and Control Groups with "Normal" Children in Visual Perception.

	Experimental Group		Control Group		
Test	Mean Change	S.D.	Mean Change	S.D.	t
Frostig	6.500	8.826	+ 4.666	13.255	- .495
Eye-hand	.416	2.083	+ 1.333	2.424	1.178
Figure-ground	.666	2.035	+ .083	2.391	- .764
Form constancy	.750	1.539	- .500	2.876	-1.709
Position in space	.583	2.668	+ .250	2.632	- .354
Spatial relationship	0.000	1.841	- .250	1.712	- .392
SRA					
Perceptual	3.125	28.938	+13.833	18.205	1.166

Table 21

Differences in Mean Change in Visual Perception in the Experimental Group with "Normal" Children

N=24

Test	Mean Change	S.D.	t	p
Frostig	6.500	8.826	3.607	<.05
Eye-hand	.416	2.083	.979	
Figure ground	.666	2.035	1.604	
Form constancy	.750	1.539	2.386	<.05
Position in space	.583	2.668	1.070	
Spatial relationship	0.000	1.841	0.000	
SRA Perceptual	3.125	28.938	.529	

Table 22

Differences in Mean Change in Visual Perception in the Control Group with "Normal" Children

N=12

Test	Mean Change	S.D.	t	p
Frostig	4.666	13.255	1.219	
Eye-hand	1.333	2.424	1.904	
Figure ground	.083	2.391	.120	
Form constancy	- .500	2.876	- .602	
Position in space	.250	2.632	.328	
Spatial relationship	- .250	1.712	- .505	
SRA Perceptual	13.833	18.205	2.632	<.05

Table 23

Differences in Mean Change in Intelligence Between
Experimental and Control Groups with "Normal" Children

Test	Experimental Group N=12 Mean Change	S.D.	Control Group N=6 Mean Change	S.D.	t
SRA	-2.000	24.323	4.583	7.959	.907
Verbal	-7.041	27.396	- .583	8.607	.792
Perceptual	3.125	28.938	13.833	18.205	1.166
Number	1.708	27.033	- .916	7.786	- .327
Spatial	-6.250	19.746	2.833	9.291	1.504

Table 24

Differences in Mean Change in Intelligence in the Experimental Group with "Normal" Children

N=24

Test	Mean Change	S.D.	t
SRA	-2.000	24.323	- .402
Verbal	-7.041	27.396	-1.259
Perceptual	3.125	28.938	.529
Number	1.708	27.033	.309
Spatial	-6.250	19.746	-1.550

Table 25

Differences in Mean Change in Intelligence in the Control Group with "Normal" Children

N=12

Test	Mean Change	S.D.	t	p
SRA	4.583	7.959	1.994	
Verbal	- .583	8.607	-.234	
Perceptual	13.833	18.205	2.632	$<.05$
Number	- .916	7.786	-.407	
Spatial	2.833	9.291	1.056	

Table 26

Differences in Mean Between Experimental and Control Groups with "Normal" Children in Achievement Tests in the Spring

Test	Experimental Group N=24 Mean Change	S.D.	Control Group N=12 Mean Change	S.D.	t
Stanford Achievement	204.291	20.109	192.833	27.024	1.435*
Word meaning	29.000	4.353	25.666	5.820	1.933*
Paragraph meaning	31.166	5.474	27.666	7.062	1.640*
Vocabulary	25.541	5.021	23.916	5.230	.902*
Spelling	18.625	1.739	17.333	2.309	1.880*
Word study	49.166	3.434	47.000	4.805	1.559*
Arithmetic	50.791	6.227	51.250	8.192	- .187
Structural reading	95.208	20.696	96.416	4.757	- .198
Initial sounds	23.875	5.093	24.833	.389	- .646
Final sounds	18.291	4.122	18.750	1.215	- .374
Sight words	21.000	4.481	22.000	0.000	- .767
Silent E	15.416	4.127	14.416	1.729	.800*
Blends	16.625	3.704	17.250	1.055	- .569
Structural Paragraph Meaning	57.750	12.803	59.416	2.968	- .442

*Favors experimental class

Appendix C

CURRICULUM FOR EXPERIMENTAL CLASS WITH "DEFICIT" CHILDREN

The extreme variability characterizing children with deficits demands attention to clinical educational techniques of proven value. It is recognized that there are many children who have deficits of differing intensity which do not, however, interfere with their learning abilities. Such phenomena seem to indicate that the organism has sufficient reserve to compensate for certain isolated defects and that in any biological system, normalcy must have a considerable range. It is suggested that the child be allowed to progress through relatively intact input channels as one attempts to strengthen his weaknesses. In this way the child achieves some security in his abilities. If more knowledge could be gained of how the sensory system fits into a hierarchical relationship and where and how it fails to do so, the child could be helped to reorganize and/or compensate.

Although many theorists (33) (16) have suggested that children with deficits in bodily schema, perceptual-motor skills and language should have a program directed toward movement, perceptual-motor training, left-right awareness and language development, there is little statistical evidence to show that these programs help the child function more normally and learn better. Some of the programs developed for "slow learners" have emphasized the elimination of sensory stimulation, placing children in isolated cubicles so that distracting stimuli may be eliminated. It is the position of this investigation that sensory stimulation is essential, but that it must be organized to act as a clue to learning. Planned properly, the classroom atmosphere can be just the setting that helps the child learn to orient himself, distinguish figure from ground, assimilate and integrate the simultaneous and sequential sensory input.

The classroom itself then becomes of the utmost importance (38). The research emphasizes the teacher's awareness of the following questions: How are the desks arranged? Are the children given clues as to where they stand and how they move about the room? What arrangements are made for the organization of materials in the room? Children are not left to guess or depend on the teacher but are taught to find and use aids which will increase comprehension and independence. Everything that is displayed must have a purpose and the room is organized so that each section has its own purpose. There should be provision made for the child to be able to isolate himself in the room behind a screen, on a cot or blanket if he becomes overwhelmed. Whenever the teacher demonstrates, she should place herself in the same position as the child and gradually as the child develops right-left awareness, she can face him in the reversed position. Probably one of the most vital principles in training is structure. In Barry's (1) words structure means "putting things in order . . . teaching limits and sequences . . . clarifying, dramatizing, simplifying, concretizing . . . bringing the foreground sharply into focus . . . blocking out nonessentials." This helps the child develop a sense of bodily schema, spatial relationship and orientation.

Each child's desk in the pilot study contains the following prearranged materials: an individual flannel board, an alphabet board with felt letters superimposed on a storage frame (50), felt forms in five colors, five sizes and five shapes, a set of blocks for training and arithmetic work, a workbook with stencil sheets suitable for training purposes and a set of colorforms for matching and pasting to stencil sheets.

The present research draws on the findings of Kephart (33), Frostig (21), Levi (36), Barry (1), Silver-Hagen (55), Montessori (38), Stern (57), DeHirsch (17) and Bryant (14), but selects only those parts that fit into its basic hypothesis.

As a result of the evaluation of each child and with careful observations on the part of the teacher, an attempt is made to formulate individual programs for the training of the child's deficits. Groups of children fall into natural clusters and can work together on similar problems.

The children had minimal problems with simple discrimination. Their problems increase as they attempt to deal with finer discrimination, organization, figure background and other integrative processes. Training must proceed in carefully graduated steps so that the child experiences success. Simple to complex tasks move in the direction of teacher support to more independent activity; from external to internal direction. Perceptual bodily schema and language skills must all be integrated with each other and with academic learning. Everything should be repeated and overlearned. Training must provide for reinforcement with many different approaches. Training should provide many opportunities to shift from one modality to another, from two dimensional stimuli to three dimensional responses and vice-versa, from a perceptual response to a language response (36).

Training in perception involves the giving of many appropriate cues for solution. Trial and error are to be kept at a minimum. Verbal mediation is an important method of both providing cues for solution and integrating perceptual and body function with the cognitive processes.

The following presentation gives a statement of deficit centered training rationale and program.

Bodily Schema

Rationale: Body image is a learned concept resulting from the observation of movements of parts of the body and the relationship of different parts of the body to each other and to external objects. In some children, this learning is incomplete. Such a child may have difficulty finding a space for himself on the floor or is unable to move various parts of the body on command.

Program: Program recommended is running, walking, hopping, jumping, skipping, rolling, etc. Suggested is bilateral, cross-lateral, alternating movements of time and position, moving fast, slow and then in rhythm to a beat or count. Stressed are exercises in awareness of body parts, locating parts of the body, balancing and the relationship of the body to other objects (climb on a chair, jump over the block, crawl under the table, go around the desk).

Rationale: Bodily schema differs from body image in that it is entirely unconscious and changes from moment to moment (21). It is derived from tactile experiences and sensations arising from the body. If a person's body schema is disturbed, he has difficulty in making coordinated movement and maintaining equilibrium. A child's ability to coordinate eye and hand and to correctly perceive both position in space and spatial relationships depends upon the development of an adequate body image and schema. A child who has difficulty may have visual distortion, be clumsy and hesitant and has difficulty with words designating spatial position such as up, down, behind, in, out, right and left. If given an academic task, letters and numbers will appear distorted and confusing.

Program: To develop concepts, the children make human figures out of clay, felt and paper. The child attaches parts of the body to the whole; learns where to place the eyes, nose, mouth and arms; which is top, bottom, front and back of the figure. The child makes a life size outline of another child and puts in the parts.

Rationale: In the child three to six, imitations are duplications of the model in which gestures have no meaning, being associated with a figurative understanding in a Piaget sense not an operative one. For this reason, responses are often mirror images before age six (5).

Program: Imitation movement from teacher to child, from a picture to child and from teacher to "standpatter" (a flexible model of a child) from picture to "standpatter" (Creative Playthings).

Right-Left Awareness

Rationale: Space is originally one aspect of the child's consciousness of his body. The course of development in spatial relations is the child's notion of right and left (61). This develops through an awareness of spatial qualities of action (personal space of action); by distinguishing left-right in an egocentric way on his own body at age six; and by distinguishing left and right on another person by eight years of age.

Program: Before a child can begin to draw a square, he should be able to distinguish between his left and right side because he must locate the beginning point with reference to his own body. Training in right-left awareness evolves from training in bodily schema with alternating bilateral and cross-lateral patterning of hands and feet. Actual demonstration and practice must follow in blackboard, pencil and paper training.

Right-left awareness proceeds by kinesthetic training as the child learns to associate directional body movements with the drawing of lines. Each child should stand in front of the chalkboard with a piece of chalk and draw a line up, down, out (away from his body) and towards the side and in, from the side of the body.

Large movements from the midline, target to target, to the beat of a metronome, with both hands, each hand separately from left to right, and right to left. All work to be done rhythmically with a metronome.

Large movement in progressive order of difficulty from simple to complex - straight line, circle, squares, triangles, etc. A child will learn first with one hand, then the other, and then both hands, and finally cross patterning. The targets will become smaller and smaller progressively, making the children more exact.

Exercises on meaningful objects (for example, "Move from the car to the parking lot") gives the child a cue to the organization and meaning of the task.

With the use of a checkerboard, have the child tap the first and last red box on each line moving from top to bottom to the beat of the metronome. This is excellent preparation for the left-right eye-hand coordination necessary in reading.

Perceptual-Motor Training

Rationale: Birch (8) has distinguished an early level of discrimination, a later level of perceptual analysis (to separate parts out of a given gestalt), and a still later level of perceptial synthesis (to see wholes). Perceptual learning consists not only of making finer and finer discriminations, but also of learning appropriate modes of coding the environment in terms of its object character, connectedness and redundancy (11). Schilder (53) points out that perception means that something is going on in space. Every sense has its part in space perception. For example, in the development of form constancy, one must be able to maintain the identify of a gestalt at various angles. Constancy grows with age and is a function of the concreteness of the problem presented and the richness of clues of the field.

Verbal mediation provides a structure and method by which the child can compensate for his perceptual deficits. It helps the child integrate the perceptual and cognitive function.

Program: The perceptual deficit-centered training will include tactile, visual and auditory modalities, moving from simple discrimination to analytic and synthetic skills. Emphasis will be on association and integration. The child's orientation and ability to maintain figure-ground and spatial relationships is paramount. The program develops from simple discrimination to more complex ones, to develop figure-ground relationships and sequencing in space and time. The goal is the integrative process.

Tactile Perception

In this population, the children were deficient in grasping, holding and pencil control. Thus, the curriculum will include such tasks as identifying by touch, blocks of different shapes, objects and materials of different textures and consistencies. Specific training in the proper holding of scissors and pencils will be given with much opportunity for practice. Exercises in all areas will be reinforced by tactile experiences with felt, clay, templates, sandpaper and sand so that children will use these manipulative tools for numbers, letters, forms, etc.

In perceptual training, one sense modality should be trained first if there is a deficiency, but should be associated with another one from the beginning if the associative processes need remediation. For instance, in "blind writing" a child's hand can trace a letter or word by itself, then he can open his eyes to add the visual modality. Generally a multisensory approach is most effective in the classroom.

Visual Perception

Training in visual perception follows a developmental plan and begins with sensory-motor training. It includes the development of physical skills and suggestions for muscle coordination and eye movements. Exercises with three dimensional objects precede and accompany the paper and pencil exercises, since concrete manipulation develops visual perceptual skills. The instructions guide the child in the acquisition of such abilities as shifting and focusing attention, classifying, paying attention to stimuli and following directions. Form perception will follow the program outlined by Silver and Hagen (55); recognition, matching, copying and recall. Concrete forms will be used first, then will be superimposed on a stencil sheet and then they will be copied. First, one form at a time will be used and later two will be combined, and then they will be superimposed on each other. The same procedure was used in the pilot study with parquetry block designs.

Initial steps in visual perceptual training involve teaching discrimination of form-integrated into a categorical reference and reinforced through tactile experiences. Flannel shapes in different sizes and colors are put on a small flannel board owned by each child. The children move quickly from understanding and organizing classes to more difficult concepts involving relationships among classes (36). We teach easy categories like color and shape and then have the child practice shifting sets from one category to another and then from a pair of categories to another pair. The curriculum is interrelated so as not to isolate one learning experience from another. For example, these same flannel boards were used to teach relationships in space, namely, on top of, behind, to the right of, to the left of, on the upper left hand corner, etc.

Perceptual training should be tied in with what is important for the child such as sorting silverware, or helping a child to read or write a story about himself, to construct a model, solve a puzzle or cut a pattern for a doll.

Visual perceptual training on stenciled sheets proceeds in easy, graduated steps with likenesses and differences of form to letter-like form and directly into discrimination and learning of letters and numbers. These exercises were considered important for simple discrimination, position in space and a direct progression into the skills area.

Many devices were used to help the children match various forms from simple to complex and to then copy the forms and finally recall the forms. Many three-dimensional type materials are used, such as colored cubes, parquetry blocks and peg boards. In each case the child first has to match identical objects with the stimulus but later must move from a paper and pencil presentation to a three-dimensional response or from a three-dimensional stimulus to a paper and pencil response. This kind of discrimination and motoric response involves a high level of perceptual discrimination, organization and constancy. Commercial puzzles are of very limited use. The design in color and line gives cues to the children so that they need not organize their percepts. Commercial puzzles can be used turned over to far more educational advantage so that the child has to work only with form and organization of space. For those children who continue to have difficulty templates are used. Children first trace with their indix finger, copy the shapes, then use their pencils or crayons and finally reproduce them from memory. Tasks involving visual memory in sequencing are utilized. These will be further described in the language section.

The visual sequential task of copying and reproducing stencil sheets with blocked out squares in different colors and patterns develops right-left awareness and visual perception as well as visual-motor sequencing.

In all tasks verbal mediation is given, as in pegboard designs - "See the two blank holes until you get to the next red peg." Setting all problems into meaningful contexts becomes standard procedure for these youngsters.

Figure-Ground Relationships

Rationale: Many of the children in the pilot study had severe deficits in figure-ground relationships. This integration ability has been related to reading (6) (17).

Program: All visual training work involves bringing the foreground sharply into focus, getting the child to attend visually to a stimulus and to disregard background. It is wise to start with clear, uncluttered backgrounds outlined in black. Gradually the background becomes less unified and more complex in itself, thereby more confusing to the child. The child is helped to distinguish clearly the ground in each case. The teacher begins with, "Put the square on top of the circle. What do you see? What is in back of the square?" The next stage involves putting pictures on lined boards and separating the picture from the background. Later the boards can be covered with different wallpaper for more complexity. Verbal mediation is used throughout.

Spatial Relationships

Rationale: The perception of spatial relationships is similar to figure-ground perception. Both involve the perception of relationships (21). Different parts are perceived simultaneously but in temporal sequence and integrated step by step into a total picture. A sequence of eye movements is involved in the perception of the simplest geometric figures. This sequential integrating process, sometimes called pattern vision, is so swift it appears to be simultaneous.

Program: Exercises involving figure completion, puzzles and assembly of parts to a whole are helpful. Needed are exercises involving visual memory. The more complicated the pattern, the greater the part played by visualization and visual memory. Simple patterns, as for example in stringing beads can be remembered and conceptualized with verbal mediation. A child can say, "Two red, two white, two blue." However, later visual imagery through channels of internalizing speech (37) is more efficient. Therefore, training should proceed from the verbalizations to the attempt to internalize what is seen first with simple patterns and then to more complex. Patterns on pegboards, marble boards or with blocks are excellent for this training. Tell the child to put the marble on the first space - leave two blank, put another marble in the third space, and so on.

The children have the most difficulty with the object assembly subtest of the WISC. Suggestions have been made to the teacher to use parquetry blocks and pegboards with verbal mediation eliminating trial and error and to use puzzles on the reverse side where the only clues provided are forms.

Auditory Perception

Rationale: One of the most significant and incompletely explored fields is that of auditory perception (58). There is a paucity of tests in this field and we suggest that most training procedures have proven inadequate.

Auditory perception leads one to select out of the total mass of auditory stimuli certain groups of sounds, each of which has a unique quality. Thus one learns to recognize the song of the bird, the ringing of the telephone, etc. Combinations of sounds come to have significance because they form the sounds of speech, becoming the symbols of language as words, phrases and sentences. In order to perceive gestalts or patterns of speech, one must call upon auditory memory. If auditory memory is poor, the individual finds it difficult to recognize the speech sounds individually and almost impossible to remember the long series of sounds which make up sentences. It is possible to see how a child can achieve a perfect audiogram in a pure tone audiometer test. There are no complex patterns of sounds in the test for him to analyze; there is no background noise to attract his attention (16).

Program: The following represents steps seen by this study as necessary for training in auditory perception. First, differences in sounds must be discriminated. For example, the child must recognize and discriminate the sounds of bells, drums, walking feet, wooden beads dropped into a tin can, pebbles rattled in a box. Second, differences in pitch must be discriminated, such as up and down and using such tools as Montessori sound boxes and bells, drums, zylophones and piano. Third, differences in intensity must be discriminated from loud to soft. Fourth, there must be training in auditory patterning. Auditory patterning is on a higher integrative level and is analagous to figure-ground and spatial relationships in the visual field. There is a temporal and sequential relationship in all auditory patterning which strengthens auditory memory.

The child responds to a fast or slow tempo of drum beats or chords on a piano by marking the proper column on a chart. We encourage the child to watch and listen as two or more sounds are made. His back is turned and the teacher produces one sound, then taps the child who has to identify by pointing to the correct soundmaker. The child may be trained to imitate musical instruments heard by using gestures - beating on a drum, playing a piano or blowing a horn. We develop recognition and recall of auditory patterning through the use of a Morse Code Signal set. The child hears patterns, from simple to more complex and must state the pattern and later recall it. Auditory discrimination training proceeds from recognition of similarities to duplication by recall. Therefore, the child is always asked to state the pattern and then reproduce it. The pilot study has shown us that verbal mediation is an important step in developing these auditory patterns. The children using the oscillators have been using the techniques of "run, run, walk, walk" and are therefore able to reproduce more accurately. As in spatial relationships, the final stage requires the internalization of the verbal mediation.

Auditory Figure-Ground Relationships

Auditory patterning can be developed against a background of soft recorded music, which can help many children to block out other extraneous noises and to attend to the given stimulus. Background noises are increased in complexity as the child masters the earlier stages, until he can proceed against a background of noise.

Auditory-Visual Integration

Rationale: Birch (9) has stressed the importance of the integration of two sensory modalities. He has shown that auditory visual integration is related to achievement in reading.

Program: When the child has mastered steps in auditory patterning and spatial relationships, the integration of the two fields should be attempted. Children using auditory oscillators (Morse Code Sets) may be trained to use verbal mediation to learn to conceptualize the temporal patters and then select the correct visual representation of patterned sounds (8).

There is a natural progression from this stage to the natural sound discrimination of letters. Two familiar speech sounds, for example, b and o, may be used. The teacher puts the two visual letter symbols on the chalkboard and then says one of the sounds into a hearing tube. The child responds by pointing to the letter form. When the child can identify these correctly, the teacher adds a one-syllable word using the same technique of having two on the blackboard. The teacher can proceed to two-syllable words and three. In addition, different phonemes have different levels of complexity and here again one must proceed from the simple such as big and pig to the next level, vat and sat and still more difficult bath and bass.

Tactile-Visual-Auditory-Motor Integration

Time sequencing through rhythmic movement (49) will later be coordinated to tactile and visual modalities. For example, first the child will clap, march, tap in imitating movement; later he will do it to auditory clues, and then he will translate the auditory or visual clues to tactile rhythmic movement on paper.

Language

Rationale: Language, broadly speaking, is included in the process of the child's development from the first months of life. By naming objects, perceiving them visually, auditorily, tactually, so defining their connections and relations, the adult creates new forms of reality in the child (37). The whole process of transmission of knowledge and formation of concepts is the basic way the adult influences the child and constitutes the central processes of the child's intellectual development. Language is the ability to comprehend and use symbols (words, pictures, numbers, letters). Inner language is the symbol system used for thought, memory, imagination and reason. Language is organized in a time space pattern. Speech demands sequential organization of linguistic units in time. Needed are abilities in auditory memory span and auditory discrimination. There is a direct relationship between auditory disorders and language development (39). Children generally develop the ability to communicate in sentences by two years. Children with slower developing auditory perception are found to be slower in beginning to talk and slower in acquiring speech accuracy. Reversals of sound in speech show up as reversals in reading. It is possible that some basic disturbance in temporal-patterning underlies the rhythmic disorders of both reading and speech causing difficulty with naming (word finding), remembering letters of the alphabet or the days of the week (17).

Program: The pilot study suggests that higher levels of vocabulary development may be trained. Opportunities must be provided so that the child may expand his mastery of verbal communication.

Selected parts of the Peabody Language Development program (43) will be incorporated providing experiences in riddle solving, guessing, dramatizations, classifications and categorizations.

All parents will be assigned stories to read to their children at home. Discussions and dramatization of these stories will be an integral part of the program. Puppets and Standpatters (Creative Playthings) will be included. The importance of this was shown with parents commenting on its success. The program proceeds from an enumeration of objects and words (the discrete level), to a discussion of the pictures and story (descriptive level), to the development of sequential information, to the use of generalizations and inferences. Pantomime and imitation of bodily position are developed with the use of puppets and Standpatters.

Rationale: The thought process develops in three phases: 1) learning to generalize, 2) seeing relations between concepts, and 3) seeing relations between conceptual relations (36).

Program: It is noted that categories rather than descriptions be taught with the idea of eventually getting to relations among relations rather than among qualities. Easy categories like color, shape, pairs are recommended while shifting the child's set from one category to another, then a pair of categories to another pair. For example, "Tell five things used in eating; five things, four of them used for eating and one not used for eating." Instructions like, "Draw a pair of things the same shape but not the same color," to "Draw a pair of things not the same shape nor the same color," to "Draw five things which contain two alike pairs."

The ITPA has helped us devise new techniques. The children in our sample showed deficits in visual motor sequencing, auditory vocal sequencing, motor encoding, vocal encoding and visual-motor association.

Program: The following techniques are suggested:

Visual-motor sequencing: Train the child to work first with familiar pictures of objects, then forms, then letters for correct sequential arrangement.

Use not only method as in ITPA, but use magnetic boards, blackboard, stamp pads and felt boards to motivate the child and train in various visual-motor sequential tasks. The checkerboard approach and matching of blocks from paper designs contributes to the training.

Auditory-vocal sequencing: First have children exchange telephone numbers with each child learning to repeat a friend's phone number; then train to remember digits and nonsense syllables. Playing the rumor game is fun for children.

Motor encoding: Develop pantomime and imitation of gestures using only motor skills without verbal mediation; first teacher directed, then child directed. Act out, "What am I? What am I using?"

Vocal encoding: Train proper sequencing in describing an object, then play a game (child puts hand in box and takes out object without classmates seeing it and describes the object to class; children must guess the object without seeing it).

Visual-motor association: Train children to categorize (36) in various dimensions: color, shapes, size, singleness, pairs, triplets, aliveness, humanness, usage, equality, identity and similarity. Then proceed with relation between concept. For example, draw a red circle, a large square, a pair of circles carefully sequenced in order of difficulty. The last stage of conceptualization may be developed with the Columbia Mental Maturity Scale cards by asking the child, "Which thing on the card doesn't belong with the others and why not?"

Reading Program Rationale

The sight method which was conceived as a way of responding to the child's perception and language usage in a global fashion does not take into consideration the difference between the semantic aspect of language and the external vocal aspect. The semantic aspect proceeds from the whole to the discrete. Words have the meaning of sentences and only later does the child understand the total and discrete meaning of the word. In the vocal aspect, the child develops from the use of individual words to phrases and sentences and to complex external performances (60). When the child comes to school, he has a vocabulary of many thousand words. These words are often poorly differentiated and extremely general. The purpose of language development is to have the child differentiate meanings and organize his thought processes and his language more finely. Reading for children with deficits should proceed as in the development of the articulatory aspect of speech. In other words, to build up rather than differentiate down; from elements into wholes. The child does not relate his meaningful language automatically to the written word. One should not assume that the acquisition of the reading skills is analogous to the child's comprehension of language. Children without deficits in language, bodily schema and perceptual-motor functioning can and do bridge the gap between the wholistic presentation of the word and his imperfect understanding of what makes it up. It is felt that children who learn successfully through the sight method do so implicitly and on a somewhat unconscious level. Children with deficits must be made aware of the discrete differences within words, how they relate to sounds and to meaning. None of this can be taken for granted in children with deficits.

Structural Reading

Rationale: Structural reading implies an emphasis on understanding structure (57). It does so by giving the child an insight into the relationship between the spoken language and its written counterpart. The children are given tools that enable them to develop the ability to read, write and spell. The program begins with an analysis of the spoken word and proceeds step by step to give the child insight into the structure of the written word - the sentence, the paragraph and the story. Learning by insight enables the child to transfer what he has already grasped to the understanding of new tasks. To learn means to discover and explore, not to memorize by rote.

Program: The program will consist of teaching each letter by name and sound and number in an organized structured manner so that it always remains the same (isolation of object). The letters and numbers are coded by number of spaces and direction of writing. Once taught, the letter or number becomes a visual clue as it is placed in a special order and sequence on display in the room. The child is able to refer to the letter when working independently (finding the clue). All letters of one space (a, c, e) will be placed together in the same section of the room. All letters of two spaces, distinguishing 1-2 space letters (b, d, f) and 2-3 space letters (g, j, p) will be coded and clearly displayed each in their own section. All paper will be three-space lined and numbered. Experiences with visual, auditory, kinesthetic and tactile modalities will be used to teach the letters. The association of each letter to meaningful content (a to apple, b to boy) is essential for those children who have sensory deficits but intact conceptual ability. Such mediation is thought helpful.

Letters are taught singly at first, then combined (ma, ca, pa, ci, mi, si, etc.) so that the phoneme remains intact. Words are made as follows: ma-n, ca-t, pa-n. The reading, writing, spelling vocabulary is built rapidly. Each word taught is readily available for the child's independent work through meaningful visual aids in the room and the child's own picture dictionary. Words are built into phrases and very quickly become sentences. Children are then encouraged to write their own stories using the many words available to them. These stories become the reading charts and are shared by all in the room. All modalities are used to teach reading. Since it is the premise of this research that the intact sensory modalities be used, tactile, kinesthetic, visual and auditory methods are all integrated into the program. The exploration of modality strength and weakness is of more than theoretical interest and should largely determine teaching method. Approaches to teaching will have to be determined in terms of the individual child's strengths and weaknesses in the different modalities (18). Felt and sandpaper letters are used for the tactile experience, sand pans are used to write words. Tracing and writing in the air as well as chalkboard work emphasizes the kinesthetic approach. Visual sequencing is developed through the awareness of each letter and the visual clues are organized in the room with each word and picture displayed. Auditory training begins with the sound discriminations and the sounds of each letter. All kinds of interesting games and explorations should be developed.

Teachers may select many trade books for supplementary material and use any linguistic readers which are now available (SRA, Let's Read, McGraw Hill, Charles Merrill, Linguistica, Harper & Row). "The usual teaching which is adequate for the normal child 'the whole word method' is not adequate for the dyslexic child. Writing a word is helpful not only because of kinesthetic feedback but because each letter must be remembered and reproduced when the child has to look at a copy of the word immediately before he writes it. If he cannot write it, tracing it and copying it can prepare him for writing it. Filling in missing letters in a word is another way of focusing attention to the details and perhaps sharpening the visual memory image. Confusion of reversed images - right-left confusion should be worked on perhaps by wearing a ring or bracelet on the dominant hand in writing and tracing the confused letters. A tracing poster in the classroom can encourage frequent practice. Letters should be traced or copied in various sizes on blackboard, paper, air." (14)

Structural Arithmetic

Rationale: Structural arithmetic is analagous to structural reading in its approach to the learning process, imparting insight into the structure of the subject matter to be mastered. The emphasis is again on understanding structure. It follows Werner's (61) principle of the "immediacy of the visual phonomena" by keeping the number blocks intact and thereby avoiding counting one by one. It expresses the principle that the gestalt should be maintained as we proceed from parts to wholes and see the total relationship. In addition, it is an exploration in self discovery. It provides steps similar to the developmental sequences proceeding from the concrete to visualizations and then to the abstract symbol. It provides color and size clues to stabilize the spatial relationships.

Program: The structural arithmetic program (56) follows a program of experimentation with numerical concepts and helps the children explore through their own manipulative materials to discover the relationships in our number system.

The teacher may use whatever supplementary materials she feels contribute to the child's understanding of arithmetic and numerical concept. Games and songs and stencil sheets could be used.

The Montessori arithmetic materials are a natural compliment to the Stern materials.

Since it is repeatedly stated that children learn through different sensory modalities, here again, wide latitudes of approach are possible and emphasis should be placed on tactile, kinesthetic and visual-auditory input.

Curriculum for Two Other Classes

There is much variability in the traditional program in the Scarsdale Public Schools with emphasis on individualization. The philosophy has encouraged teachers to use those methods which they have found to be most successful. The two other classes followed their usual reading procedures using all types of supplementary and enrichment materials. Generally, the whole word method is used and then combined with word-analysis skills.

The arithmetic program has been more standardized and generally follows the Greater Cleveland Math program.

TEACHERS' CURRICULUM REPORTS

Experimental Class (Deficit Children with Problems)
Teacher: Mary Ransford

December

Reading

Smith, Donald and Mayhew, Bernice. Michigan Successive Discrimination Reading Program, Book 1. Completed.

Buchanon, C. and Sullivan Associates. Programmed Reading (McGraw Hill)
  Group 1 - Pages 1-14, Teacher's Manual
  Group 2 - Pages 1- 7, Teacher's Manual

Alphabet books for writing letters and drawing pictures of objects beginning with that particular letter.

Mathematics

Stern, Catherine. Experimenting with Numbers, Teacher's Manual, pages 86-107.

Stern, Catherine. Structural Arithmetic workbooks, pages 1-17.

Magnetic numerals
Magnetic objects for grouping in sets
Stern materials
Flannel numerals
Montessori templates

Language

Assigned poems and stories were read to the children by their parents nightly. A new assignment was made each week. This material was used as language development with body work, pantomime, dramatization, etc. The poems and stories served as a springboard for many and varied activities which developed body awareness and communication skills.

Language (Cont.)

Jacobs, Leland and Turner, Jo. Happiness Hill, pages 125; 175-181; 84-90; 182-191.

Examples of work in perception

Auditory Perception

Games such as "Doggy, Doggy, Your Bone is Gone" and "Little Tommy Tittlemouse"

Listening for words which begin with a particular sound.

Classifying picture cards according to initial consonant sounds.

Body Material

Use of opaque projector with Frostig manual, pages 22-29, Position in Space.

Use of flannel board, felt shape of face, and felt shapes of facial features.

Walking board

Balance board (rolling type)

Visual Perception

Visual motor sheets 1-20, from Visual Motor Skills, Continental Press.

Pegboard patterning
Perception plaques
"What is Missing?" Lotto
Use of templates
Use of sand
Sandpaper letters and numerals
Alphabet flannel boards with felt letters to be placed on outlined alphabet patterns.

January

Mathematics

Stern, Catherine. Structural Arithmetic workbooks, pages 18-39.

Stern materials
Additional stencil sheets

Language

Happiness Hill, pages 28-35; 53-59; 118-125; 48-52.

Individual discussion of a particular object (before other children in class) to identify, classify, and explain its function.

Reading

Buchanon, C. and Sullivan Associates. Programmed Reading (McGraw-Hill)
- Group 1 - Pages 15-98
- Group 2 - Pages 6-98

Stern, Catherine. We Discover Reading.
- Group 1 - Pages 1-20
- Group 2 - Pages 1-16

SRA Alphabet Book, pages 1-22

Continuation in alphabet books for writing letters and drawing pictures.

Stern materials:
- Word dominoes
- Flash cards
- Picture Dictionary (individual)

Examples of work in perception

Auditory Perception

Use of tapping patterns for imitation by children

Use of word lists to let children determine words with short a sound

Montessori sound cylinders

Body Material

Finger plays, action rhymes, and action songs.

Use of individual "Standpatters" (flexible plastic characters) to let each child imitate position described and demonstrated by the Standpatter used by the teacher.

Visual Perception

Perceptual constancy sheets 1-8 (Frostig)
Figure ground exercises 1-8 (Frostig)
Dot pictures with pin points

Continuation of previously mentioned auditory, body and visual training.

February

Mathematics

Stern, Catherine. *Structural Arithmetic I*, pages 40-47.

Blocking off tiles in the floor to help teach contrasting of a step of 1 and a step of 2.

Much review and individual work given with number track, blocks, and pattern boards.

Ditto sheets to reinforce proper formation of numerals and to strengthen sequencing/7/ /9/.

Using known sets of magnetic figures to demonstrate addition.

Establishing ability to record addition facts comfortably in equation or column form.

Dictation and recording on board of individual addition stories.

Calendar work

Identification of time on the clock by hours only.

Reading

Stern, Catherine. We Discover Reading.
Group 1 - Pages 20-48
Group 2 - Pages 17-48

SRA Alphabet Book, pages 23-77

Rasmussen, Donald and Goldberg, Lynn. A Pig Can Jig (SRA-Level A)
Group 1 - Pages 1-28
Group 2 - Pages 1-27

Thurstone, Thelma. The Red Book (SRA Learning to Think Series), pages 1-14.

Alphabet books for writing and pictures.

Language

Happiness Hill, pages 91-95; 96-102; 141-146.

Dictating, illustrating, and writing two original lines of verse to complete "I went for a walk
And what did I see?"

Relating the steps followed, in their proper order, in carrying out a particular project - game, such as Hopscotch; art projects, such as making a puppet or doing chalk coloring on wet paper.

Describing the differences seen in two pictures (examples in Red Book, page 24, smoking pipe, bubble pipe; piggy bank, pig, etc.).

Auditory Perception

Using metronome at various speeds for variety of activities such as tapping, moving head from side to side, tiptoeing, creative movements, etc.

Simple tapping patterns used with oscillator and earphones.

The Red Book pages such as page 9. (Teacher reads names of each pair of pictures and tells children which of pair to mark, i.e. people, steeple; cub, cup.

Body Material

Directed body work (including front body roll) on exercise mats.

Tossing and catching ball.
Playing hopscotch
Jumping hurdles
Imitating positions of characters in stories

Visual Perception

Solving puzzles from the reverse side without benefit of pattern or enclosure

Frostig Figure-Ground and Perceptual Constancy sheets

Checking details in pictures from story: "What was the bear wearing? What furniture was in the cave? Tell us about the tablecloth (checkerboard pattern)," etc.

The Red Book pages such as page 17. "Mark every picture of two and only two people," and page 18, "Find as many pictures of things to eat or drink as you can."

Experimental Class (Normal Children)
Teacher: Julia De Carlo

January

Reading

Group 1 - Jack and Janet, page 45
Group 2 - Jack and Janet, page 9
Group 3 - The Big Show, page 17

Mathematics

SRA, Combinations through Five, page 103

February.

Time spent per week:

Reading: approximately 8 hours
Mathematics: approximately 4 hours
Spelling: approximately 2 hours
Writing: approximately 2 hours

Reading

Group 1 - Peppermint Fence, up to page 117
Group 2 - Jack and Janet, up to page 167
Group 3 - Jack and Janet, up to page 83

Mathematics

Greater Cleveland Mathematics Program, up to page 158
Place value
Numbers forty through forty-none
Recognition of numerals 40 through 49
Sums of eight
Subtraction combinations through eight

Spelling

Word list taken from reading vocabulary

Spalding phonograms: Taught as met in reading vocabulary.

Control Class (Deficit and Normal Children Mixed)
Teacher: Susan Buckley

Reading) Dittos - copy teacher's
Directionality): Boardwork and experience charts

Phonics: "Getting Ready to Read," dittos, booklets

Word Recognition: Tip Vocabulary from Houghton Mifflin

Rhymes: Booklets, dittos

Comprehension: Pictures drawn to indicate sentence comprehension.

Words missing in sentences.

Program: We have four reading groups. Top three groups are in second pre-primer. Bottom group finishing first pre-primer.

Mathematics

Equivalence) Greater Cleveland Workbook
Equations) Boardwork
Sets) Dittos
Counting man) Flannel board
Placeholder)

March

Reading

Group 1 - Have finished the Big Show and now doing Jack and Janet. Ditto sheets involve completing sentences based on the story. I tried answering questions on paper and some difficulty was indicated. We are doing oral work in this area; answering in complete sentences.

Groups 2, 3, 4 - We are more than half way through the Jack and Janet book. We are answering questions based on the story; in complete sentences.

Reading (Cont.)

Spaulding Blends: We have been developing and progressing through most of the first grade requirements. We're doing it orally, applying it to known words and new words.

Forms of materials: 1. Sentences: Draw a picture:
The horse is on the porch.

Mathematics

Still working on placeholder and place value

a. Counting by ones and tens.
b. Fill in sequence of numerals and mark the tens.

Social Studies

Discussion questions